Post-Traumatic Stress Disorder (PTSD) in Ambulance Personnel:

An Investigation into risk factors and potential interventions

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Submitted in accordance with the requirements for the degree of
Doctor of Philosophy

The University of Leeds
School of Psychology

November 2022

The candidate confirms that the work submitted is his own, except where work which has formed part of jointly authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

The systematic review reported in Chapter 2, the qualitative study in Chapter 3, and the cross-sectional study in Chapter 4, have been published:

- Alshahrani K.M, Johnson J, Prudenzi A, O'Connor D.B (2022) The effectiveness of psychological interventions for reducing PTSD and psychological distress in first responders: A systematic review and meta-analysis.PLoSONE17(8):e0272732.
- Alshahrani, K.M., Johnson, J., Hill, L., Alghunaim, T.A., Sattar, R. and O'Connor, D.B., 2022. A qualitative, cross-cultural investigation into the impact of potentially traumatic work events on Saudi and UK ambulance personnel and how they cope. *BMC Emergency Medicine*.
- Alshahrani, K.M, Johnson, J., and O'Connor, D. B. (2022). Coping strategies and social support are associated with post-traumatic stress disorder symptoms in Saudi paramedics. *International Journal of Emergency Services*,

KMA, JJ, and DOC developed the concept for the systematic review and meta-analysis and were involved in designing the search terms. KMA performed the searches, screening, data extraction, analysis, and drafted the publication and thesis manuscript. All authors contributed to the screening, data extraction, provided comments, and approved the final version for publication.

KMA, JJ, and DOC developed the concepts for qualitative study. KMA designed the study with input from JJ, and DOC. KMA set up the study, gained ethical approvals. LH helped to recruit paramedics from the UK. KMA collected all the data and conducted the analysis with input from JJ, and DOC. KMA developed and defined, named the study themes with input and reviewed from RS, and JJ. KMA translated all Arabic transcripts into English and TA reviewed all translation of Arabic transcripts. KMA drafted the publication and thesis manuscript and all authors provided comments and approved the final version.

KMA, JJ, DOC designed the general conception of the survey study. KMA prepared the measurements and gained ethical approvals. KMA collected all the data and conducted the analysis with input from JJ, and DOC. KMA drafted the publication and thesis manuscript and JJ, and DOC provided comments and approved the final version.

Acknowledgements

This work could not have been done without the guidance, support, and encouragement of many people around me. I sincerely thank my wonderful supervisors Judith Johnson and Daryl O'Connor, for their endless support and exceptional guidance inside and outside academic life. I am extremely grateful for their understanding, handling, and patience with me as an international student. Their expertise and guidance greatly contributed to my research skills development, and I will forever be grateful for everything they taught me. I would also like to thank my external supervisor Lawrence Hill for his guidance, advice, and experience as an expert in paramedics' work.

To my father's soul, I wish you were here to thank you for all the support and encouragement you gave me. I miss you so much. May God have mercy on you.

To my loving mother, I know you worry about me every day. Thank you from the depths of my heart. I hope to bring happiness into your beautiful heart. Also, I would thank all my brothers and sisters for their unlimited and sincere support.

My sincere thanks are due to my sponsor, King Abdelaziz University in Jeddah, Saudi Arabia, and the Saudi Cultural Bureau in London who provided me with the necessary financial support for the completion of my degree program. I also extend my sincere thanks to all paramedics from Saudi Arabia and the UK who participated in this dissertation. Special thanks to the Saudi Red Crescent Authority for helping to recruit participants and collect data.

A huge thanks to the School of Psychology staff and PGRs at the University of Leeds for their work in creating an attractive academic environment for all students. Special thanks are due to my colleagues Arianna Prudenzi, Tmam Alghunaim, Raabia Sattar, and Adnan Alzahrani for their collaboration and support.

Finally, special thanks and gratitude to my wonderful wife, Enaas, and to my amazing children, Muhammad, Abdulrahman, and Rateel, for their support, patience and existence beside me during my PhD journey, and so happy and proud we made many beautiful memories in Leeds.

Abstract

Ambulance personnel experience many critical events that may increase their risk of developing post-traumatic stress disorder (PTSD) and other mental health disorders. In the previous literature, some studies show that the prevalence of PTSD in ambulance workers is higher than that of other first responders and that ambulance personnel in developing countries have a higher prevalence of PTSD than those in developed countries (Berger et al., 2012). However, it is unclear whether facing a higher frequency of critical events puts ambulance personnel at greater risk of PTSD symptoms. There has also been a lack of cross-cultural research to explore the reasons for different PTSD prevalence rates between developed and developing countries, and to explore the kinds of support which paramedics would like to receive. Moreover, there is a need for further research to understand risk and protective factors in ambulance personnel, and the interventions which may be most effective for ameliorating symptoms of mental distress.

To address these gaps, this thesis aimed to understand the impact of critical incidents on ambulance personnel, the factors which may affect the relationship between incident exposure and symptoms of trauma, and the support which organisations should provide. The thesis addressed these questions with a particular focus on Saudi Arabian ambulance personnel who face high rates of critical incidents.

Altogether, one systematic review and meta-analysis and three original empirical research studies were completed. The systematic review was conducted to examine the effectiveness of psychological interventions to treat PTSD and other mental health disorders in first responders. The meta-analysis found that psychological interventions were associated with significant reductions in PTSD symptoms, depression and anxiety, but not stress. Moreover, Cognitive Behaviour Therapy (CBT)-based and clinician-delivered interventions were associated with significantly greater reductions in PTSD than other types of interventions and non-clinician interventions, but no differences were found for depression.

In Study 1, I conducted a cross-cultural qualitative investigation among ambulance personnel in Saudi Arabia and the UK to explore the lived experience of potentially traumatic work events between Saudi Arabia and UK ambulance personnel. This study identified four themes. Some types of events were intrinsically more stressful than others (e.g., events involving threats to the paramedics themselves); organizational pressures increased the impact of stressful events; the use of sports activities was a common method for coping with painful events; and there was a preference for formal support over informal.

In Study 2, I conducted a survey to estimate the prevalence rate of PTSD symptoms in Saudi ambulance personnel and investigate whether passive and active coping strategies and social support were associated with PTSD symptoms. This study found that 46% of ambulance workers reported at least one symptom of PTSD and that reporting higher levels of passive coping and lower social support were associated with greater risk of reporting PTSD symptoms.

In Study 3 I used a daily diary method to investigate the association between daily PTSD symptoms and daily incident exposure, coping styles and social support in Saudi ambulance personnel. The study found that higher numbers of daily incidents were strongly associated with a greater number of daily PTSD symptoms, and passive coping moderated the association between daily incidents and daily PTSD symptoms.

In combination, these studies identified the importance of providing formal and confidential support that involves a CBT model for ambulance personnel and encouraging them to use active coping strategies rather than passive coping when facing traumatic incidents.

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Chapter 1 Introduction

1.1 Thesis overview

In many occupations, the performance of workers may be affected by work stress. One of these jobs is that of first responders who regularly face risky and traumatic events in their duties (Papazoglou, 2017). Professional first responders include rescue disaster workers, ambulance personnel, firefighters, police officers, and military personnel (Kleim and Westphal, 2011).

One group of first responders, ambulance personnel, play a key role in health systems in every country by providing clinical care and professional transport for patients. They face many critical events in their daily work (Care, 2007; Pyper and Paterson, 2016). According to National Emergency Medical Services (EMS, 2019), ambulance personnel including paramedics and emergency medical technicians (EMTs) are health professionals who are responsible for responding to, assessing, and triaging emergent, urgent, and non-urgent medical care requests and providing patient care and transportation to a healthcare facility or emergency room.

Paramedics differ from EMTs in their primary role and type of education. Paramedics hold an associate's or bachelor's degree in medical sciences, and their primary role is to provide advanced care in various settings, utilise interpretive and diagnostic abilities, identify destination needs within the healthcare system, and provide specialised transportation. EMTs instead have a vocational qualification for emergency work and their primary role is to provide fundamental patient care and medical transportation within the emergency care system (EMS, 2019).

In both Paramedics and EMTs, there are several factors which contribute to increased stress symptoms, including repeated exposure to stressful events, organisational stress, shift work, unpredictability, low social support, hours worked, and fatigue (Petrie et al., 2018). Post-traumatic stress disorder (PTSD) prevalence among them is higher than among other workers and the general population, with rates ranging from 1.3% to 22% (APA, 2013; Berger et al., 2012; Ntatamala and Adams, 2022; Wilson, 2015).

There are substantial personal and public costs associated with PTSD among paramedics, and this can adversely affect their performance when helping victims and patients (Kleim and Westphal, 2011). For example, the repetition of the traumatic

event, the rescue and evacuation of dangerous sites, and low perceptions of safety may have implications for ambulance personnel and first responders' long-term health and morale and affect their work-related (EMS, 2019) behaviour (Kleim & Westphal, 2011). Moreover, there are some economic and social costs related to PTSD. For instance, in Canada, mental illness within the Canadian labour force, particularly among first responders, leads to a loss of productivity of approximately 21 billion dollars each year (Wilson, Guliani, and Boichev, 2016).

Ambulance personnel can encounter a variety of traumatic events. Some of these events may occur during rescue operations, when witnessing injuries to victims, or through exposure to death. Furthermore, ambulance workers who suffer an injury or occupational disease in their duty may have to retire. Repeated exposure to traumatic incidents may increase paramedics' risk of developing PTSD symptoms, which could lead to early retirement (APA, 2013; Brooks and Brooks, 2021; Wittchen et al., 2012).

Coping strategies may also play a role in preventing or contributing to the development of PTSD in ambulance personnel (e.g., Brooks and Brooks, 2021; Jonsson, Segesten, and Mattsson, 2003; Loef et al., 2021; Mildenhall, 2012; Sterud, Ekeberg, and Hem, 2006). Furthermore, social support could be an important factor in predicting PTSD symptoms in paramedics (e.g., Prati and Pietrantoni, 2010; Reti, 2021; Reti, de Terte, and Stephens, 2022; Shakespeare-Finch, Rees, and Armstrong, 2015). However, there are still many issues related to first responders and ambulance personnel that require further investigation, including establishing appropriate psychological interventions to reduce mental disorders such as PTSD. Moreover, there is a need to compare the nature of traumatic incidents in first responders in developed and developing countries and understand how they handle these incidents and the reasons for the high prevalence of PTSD in ambulance personnel from developing countries. Therefore, this thesis addresses these gaps through the four studies outlined below:

- A systematic review and meta-analysis to examine the effectiveness of psychological interventions to treat and reduce PTSD and other psychological disorders among first responders.
- A qualitative study to investigate the impact of traumatic events and coping strategies used by Saudi and UK ambulance personnel.
- A cross-sectional study to explore the association between PTSD symptoms, coping strategies and social support among ambulance personnel.
- A daily diary study to examine the association between daily incidents and daily PTSD symptoms.

1.2 First responders overview

First responders are a heterogenous group of paid professionals and volunteers who provide critical services in emergencies (Haugen, Evces, and Weiss, 2012, p 370). These individuals attend the scene of critical incidents in order to meet the physical needs of injured victims, making first responders distinct from military personnel who may attend similar events but primarily address issues of safety (Kleim and Westphal, 2011).

Traditionally, the term first responder is used to describe a range of occupations and professions, including firefighters, police officers, and paramedics (Benedek, Fullerton, and Ursano, 2007; Greinacher, Derezza-Greeven, Herzog, and Nikendei, 2019). However, some studies disagree about which groups should be classified as first responders (Benedek et al., 2007). For example, some studies have categorised call dispatchers, nurses, correctional workers, physicians, and public safety personnel as first responders. As such, a distinction can be made between traditional first responders including firefighters, police officers, and ambulance personnel (paramedics and emergency medical technicians, EMTs) and non-traditional first responders. The non-traditional first responders are confined to work during and after the occurrence of natural or man-made disasters, such as heavy equipment operators, mechanics, and laborers who remove rubble from debris piles (Benedek et al., 2007; Carleton et al., 2019; Katzman et al., 2021). In some studies, the term 'risk workers' is used to incorporate both traditional and non-traditional first responders (Di Nota, Bahji, Groll, Carleton, and Anderson, 2021; Carleton et al., 2020).

1.3 PTSD overview

PTSD appeared as a category in the ninth edition of the International Classification of Diseases (ICD.9) in 1979 (Turnbull, 1998). It was also subsequently identified as a psychological disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) in 1980 (APA, 1980). Over the years, traumatic and psychological symptoms have been identified and described using different terms, starting in the late 19th century when they were observed as a result of railway incidents which were common at that time, such as 'spinal concussion' and 'railway spine' (Harrington, 1996; Turnbull, 1998). Later, PTSD symptoms were observed in soldiers following their combat experiences in wars and were labelled as 'shell shock', 'soldier's heart' and 'Da Costa's syndrome'. The latter term was due to the work of Dr Da Costa, who noticed the prevalence of certain symptoms among soldiers during the American Civil War (Jones and Wessely, 2005; Paul, 1987). In 1893, Freud used the term 'neurosis' to describe traumatic symptoms, and he stated that neurosis was the result of

traumatic events in childhood (Ray, 2008). During the Vietnam War, there was widespread concern about trauma symptoms after soldiers returned home suffering from psychological distress. Therefore, the diagnosis of PTSD was developed in the DSM-III in 1980 and DSM-IV in 2002 under anxiety disorder categories (Krippner, Pitchford, and Davies, 2012).

1.3.1 Diagnostic criteria of PTSD

The 11th edition of the International Classification of Diseases (ICD-11) provides two distinct categories, namely PTSD and complex PTSD (CPTSD), which are both classified under a general parent category of 'Disorders specifically associated with stress'. According to the World Health Organization (WHO, 2018), PTSD is comprised of three clusters including: 1) re-experiencing traumatic events in the present which manifests as intrusive memories, flashbacks, or nightmares; 2) avoidance of traumatic reminders including thoughts, activities, or people: and 3) persistent perceptions of heightened current threat which may relate to exposure to actual or threatened death, sexual violence, serious injury in one or more of direct experience of the traumatic event(s), witnessing the event(s) in person as they happened to others, knowing that the traumatic event(s) happened to a close family member or close friend, and experiencing repeated exposure to upsetting details of the traumatic event(s) (APA, 2013).

Meanwhile, CPTSD is a term that Herman (1992) first used to describe a syndrome that was observed in those who had been exposed to prolonged, repetitive trauma (Resick et al., 2012). Six symptom clusters defined by ICD-11 characterise CPTSD. Three are similar to PTSD (reexperiencing, avoidance, and sense of threat), and the other three are associated with disturbances in self-organisation (DSO). These symptom clusters are 1) affect dysregulation such as heightened emotional reactions to minor stressors, violent outbursts, reckless behaviour, and emotional numbing; 2) negative self-concept, such as feeling remorse for not escaping or suffering from adverse circumstances or for not preventing others from suffering; and 3) relationship difficulties such as lack of interest in building relationships with others and avoiding social participation in general (Brewin et al., 2017; WHO, 2018b).

In the DSM-5, PTSD is categorised as a 'Trauma and Stress Related Disorder' with 20 PTSD symptoms. In criteria A, a person must have been exposed to traumatic events in order to be assessed for PTSD. In this case, "a direct personal experience with a death, serious injury, or sexual violation" is required. Having witnessed the traumatic event(s) as it occurred to others; receiving notification that the event(s) occurred to close family members or friends; being repeatedly exposed to aversive

details of the traumatic event(s). According to the DSM-5 (APA, 2013), four main clusters and the specific symptoms under each cluster include the following:

- First, an intrusion which in the DSM-5 is known as criterion B is considered to be associated with a traumatic event(s) if one or more of the following are present: recurrent and distressing memories, recurrent distressing dreams, dissociative reactions, intense or prolonged psychological distress when exposed to signals that led to the traumatic event(s), and marked physiological reactions to cues that relate to traumatic event(s).
- Second, avoidance is classified as criterion C. This cluster refers to the avoidance of all stimuli associated with traumatic event(s) which are characterised by one or both of following: avoiding distressing memories, thoughts or feelings related to traumatic event(s) and avoiding external reminders such as people, places, and activities that are associated with traumatic event(s).
- Third, negative alteration in cognition and mood associated with traumatic event(s) as demonstrated by two or more of the following: inability to remember an important part of traumatic event(s); exaggerated negative beliefs or expectations about self, others, or the world; distorted and persistent cognition about causes or consequences of traumatic event(s); negative emotional state; lack of interest or participation in interesting activities; feeling detached from others; and inability to experience or difficulty experiencing positive emotions.
- The fourth cluster is arousal and reactivity connected with traumatic event(s) as demonstrated by two or more of the following: irritable behaviour and angry outbursts, irresponsible or self-destructive behaviour, hypervigilance, exaggerated startle response, problems with concentration, and sleep disturbance.

1.4 Prevalence of PTSD in first responders

The prevalence of PTSD among adults ranges from 0.5 to 3.5% in the general population. Some professions such as first responders record higher rates of PTSD than the general population (APA, 2013). The prevalence rates of PTSD among first responders vary widely. Several reasons for such variation in estimates have been proposed, including differences between scale types, diagnostic classification, trauma cases, and inconsistent sampling methods and sizes. A systematic review and meta-regression of 28 papers conducted by Berger et al. (2012) reported on the prevalence of PTSD among rescue workers. They found that the global pooled prevalence of

PTSD was 10%, and on average, meta-regression modelling conducted in Asian studies yielded estimates higher than those in Europe but not higher than North American estimates. Furthermore, ambulance personnel were found to have a higher estimated prevalence of PTSD than firefighters and police officers (Berger et al., 2012).

Another systematic review investigated the effect of human-made mass violence on first responders. Among the 20 studies reviewed (15 of which focused on first responders following the September 11th terrorist attacks), the prevalence rate of PTSD varied from 1.3 to 22% (Wilson, 2015). Similarly, Motreff and his colleagues (2020) conducted a study to measure the psychological impact of the terrorist attacks of 13 November 2015 on first responders. They measured PTSD and partial PTSD as well as associated factors 12 months after the attacks. Among 663 participants, the study found that the prevalence of PTSD and partial PTSD were 4.8 and 15.7%, respectively.

All previous studies have demonstrated that first responders are more likely to suffer from PTSD than other professionals because they work under high stress levels and are repeatedly exposed to traumatic events (Skogstad, Skorstad, Lie, Conradi, Heir, & Weisaeth, 2013). Consequently, they are at an increased risk of developing long-term psychological problems related to traumatic stress.

1.5 Prevalence of PTSD in ambulance personnel

The prevalence rate of PTSD among ambulance workers has been found to be higher than that found among other first responders (Berger et al., 2012), which may be due to them facing greater stresses and pressures at work, receiving more emergency calls than police officers and fire fighters combined, having poor employer support, and being in closer contact with victims (Berger et al., 2012; Drewitz-Chesney, 2012; McFarlane & Bookless, 2001). A systematic review and meta-analysis focusing only on paramedics suggested that the prevalence of PTSD in this group was 11% (Petrie et al., 2018).

There is a significant difference between developed and developing countries in the prevalence rates of PTSD in ambulance personnel. In developed countries, the prevalence of PTSD is consistently lower than the rates in developing countries (Berger et al., 2012). For example, a survey conducted to estimate the prevalence of trauma-related disorders among 362 Swedish ambulance workers used two scales of traumatic events, namely the Impact of Event Scale (IES-15) and the Post-Traumatic Symptoms Scale (PTSS-10). This study found that the prevalence rate of PTSD among Swedish paramedics was 15.2% on the IES-15 scale and 12.1% on the PTSS

scale (Jonsson, Segesten, and Mattsson, 2003). In Germany, a nationwide cross-sectional survey conducted by Eiche, Birkholz, Jobst, Gall, and Prottengeier (2019) used the 5-item World Health Organization Well-Being Index (WHO-5) scale to assess 2,731 paramedics and emergency physicians. The study found a prevalence rate of PTSD 5.4%. Another study conducted in the UK by Stevelink et al. (2020) investigated mental health outcomes among paramedics as compared to other workers as well as associations with other factors. The 5,052 participants completed the 6-item PTSD Checklist PCL-6, and 842 of them were working in emergency services. The prevalence of PTSD in emergency services personnel was 9.2% compared to 6.0% in other occupations.

In comparison to these figures, studies of ambulance personnel in developing countries have reported higher PTSD prevalence estimates. For instance, Iranmanesh, Tirgari, and Bardsiri (2013) conducted a cross-sectional study among 400 Iranian paramedics and emergency personnel using the Mississippi Scale for Post-Traumatic Stress Disorder (M-PTSD). This study indicated that 94% of participants experienced moderate PTSD. Using a similar method, Abu-El-Noor and his colleagues (2016) investigated PTSD prevalence among 324 healthcare providers including paramedics after attacks against Gaza in 2014. They used the Impact Event Scale – Revised (IES-R) to measure PTSD symptoms. PTSD prevalence in health providers was 89.8%. Using the same scale (IES-R), Kerai et al. (2017) conducted another cross-sectional study to assess symptoms of PTSD and its predictors among 518 Emergency Medical Service (EMS) personnel in Pakistan. The results indicate that more than half of 278 participants (53.6%) reported that they had been traumatised by their work.

However, it has been suggested that the differences between developed and developing countries may be explained by various factors such as differences in scale types, diagnostic classifications, trauma status, sample size, and methods. Additionally, it may be due to differences in organisational structure between countries, a lack of integrity when responding to questions, differences in education level, and differences in workload (Iranmanesh et al., 2013).

1.6 Risk factors for PTSD

Several variables have been identified as risk factors for PTSD. According to Maes, Mylle, Delmeire, and Janca (2001), some factors may be more strongly associated with the development of PTSD, and these can be classified into three categories: 1) pre-exposure risk such as gender, having experienced multiple traumas in the past, and past history of psychiatric disorders; 2) pre-traumatic risk, including previous

exposure to traumatic events, seeing injured or dead victims, having a fear of dying during the disaster, and losing control during the trauma; and 3) post-traumatic risk, such as the severity of injury caused by trauma incidents.

Brewin, Andrews, and Valentine (2000) conducted an early meta-analysis of 77 articles on PTSD risk factors which examined 14 different risk factors of PTSD in adults. They found that some factors such as trauma severity, a lack of social support, and additional stress which were present during or after trauma had a more significant impact than factors which were present before the trauma such as age at time of trauma, gender, education, reported childhood abuse, and family psychiatric history.

Following this seminal review, Ozer, Best, Lipsey, and Weiss (2003) conducted a review of 68 studies among adults and meta-analysed their findings to find the factors that best predicted PTSD. They identified seven key predictors, namely prior trauma, prior psychological adjustment, family history of psychopathology, perceived life-threatening events during the trauma, post-traumatic social supports, peri-traumatic emotional reactions, and peri-traumatic dissociation. Moreover, the results indicated that peri-traumatic psychological processes were stronger predictors of PTSD than prior characteristics.

As a result of the above studies, it is now widely recognised that there are several variables which may affect the onset and severity of PTSD symptoms following trauma exposure. The severity of the symptoms depends on the risk during and after traumatic events. Other factors such as the type of trauma, absence of social support, and additional stressors experienced during and after trauma played a more significant role than those present before it.

1.6.1 Risk factors for PTSD in first responders

First responders who are at higher risk of PTSD include those who have another mental illness, experienced an injury during rescue operations, or have other acute psychological disorders in the initial aftermath of an event (Kleim and Westphal, 2011). A cross-sectional study conducted by Marmar et al. (2006) examined the risk and resilience factors associated with PTSD symptoms in 715 police personnel and other first responders. They found five variables which were significantly associated with PTSD, namely greater peri-traumatic distress, greater dissociation, problem-solving coping, routine work environment stress, and a lower level of social support. They also found that peri-traumatic reactivity played a key role in the development of PTSD symptoms. Motreff et al. (2020) conducted another study to assess the psychological impact of PTSD and factors associated with it among first responders 12 months after the Paris terrorist attacks in 2015. They found that higher exposure, lower education level, social isolation, and a lack of training were strongly associated with PTSD.

Kleim and Westphal (2011) discuss various risk factors for PTSD among first responders in their non-systematic review and found that the risk factors can be categorised into demographic factors, pre-trauma characteristics (e.g., prior mental illness), cognitive processing characteristics during the event itself (e.g., sense of self-worth and social support), and aspects of post-event processing (e.g., organisational characteristics and interpersonal environment). Another study by Soravia, Schwab, Walther, and Müller (2021) aimed to identify the risk factors for PTSD among 1,002 rescue workers. They found that higher psychological strain, suicidal ideation, gender (female), years of work (more than 12 years), dysfunctional coping (passive coping), and lower self-efficacy were related to higher PTSD.

Overall, factors which have consistently emerged from the literature as risk factors for PTSD in first responders include lack of social support, poor coping strategies, insufficient training, suicidal thoughts, a low level of education, and higher exposure to trauma. However, only a relatively small number of studies have investigated these factors and most studies have been in police and firefighters (e.g., Alghamdi, Hunt, and Thomas, 2017; Violanti et al., 2018). There is a need to conduct more research on the association between these factors and PTSD among ambulance personnel.

1.6.2 Risk factors for PTSD in ambulance personnel

Ambulance personnel are at greater risk of a number of psychological, physical, and social difficulties than other people in general or other healthcare professionals (Sterud, Ekeberg, and Hem, 2006b). Causes of trauma symptoms in this group can include exposure to critical incidents, negative workplace culture, day-to-day managerial actions and responses, the system of shift work, and working long hours with little rest (Lawn et al., 2020). Work-related stressors, daily occupational stressors, and social conflict are also factors which must be considered for the safety of both the public and the employee (Hruska and Barduhn, 2021; Jones, 2017).

A recent systematic review examined the factors that predict PTSD in ambulance personnel from 18 papers. It was found that four types of factors were significantly related to PTSD, namely dysfunctional coping styles, personal factors such as length of service, environmental factors such as direct threats while on duty, and organisational factors such as high level of organisational stress (Brooks and Brooks, 2021). More broadly, the previous literature has provided evidence that a variety of factors can contribute to the development and severity of PTSD symptoms in ambulance personnel. The following sections discuss the risk factors investigated in this thesis in detail.

1.6.2.1 Traumatic events

According to criterion A in the DSM-5, a person needs to be identified as having been exposed to traumatic events to be assessed for PTSD (see section diagnostic criteria of PTSD page 4) (APA, 2013). According to Levin , Kleinman, and Adler (2014), there are four ways in which an individual can be exposed to a potentially traumatic event, namely 1) experiencing the event directly, 2) witnessing the traumatic event, 3) learning that the traumatic event happened (either violently or accidentally) to one or more family member or close friend, and 4) experiencing repeated or extreme exposure to traumatic details first hand (excluding media, television, and movies unless work related; Levin, Kleinman, and Adler, 2014). Accordingly, trauma victims can be divided into two groups, namely 1) victims who were directly impacted by an event that threatens their personal life or health such as sexual violence and 2) victims who may be indirectly exposed to traumatic events such as the sudden loss of a family member (Alghamdi, 2015; Saari and Silver, 2005).

Traumatic events can be categorised into three types, namely 1) inherent life cycle stressors such as sudden and unexpected death of a loved one or chronic disease; 2) natural disasters including hurricanes, earthquakes, and floods; and 3) man-made disasters such as war, sexual assaults, and terrorism (Shaw, 2000).

Skogstad and her colleagues (2013) conducted a systematic review to discover that the occupational groups most at risk of developing work-related PTSD are police, firefighters, and emergency medical personnel. Several studies have been conducted regarding the association between exposure to a potentially traumatic event and PTSD among these occupational groups. For example, a study by Wittchen and his colleagues (2012) compared the PTSD rate of German soldiers who had served in Afghanistan (n = 1,483) to that of those who had not served any military missions abroad (n = 889). Wittchen et al. found that 49% of deployed soldiers experienced at least one potentially traumatic event during their duties in Afghanistan, and 13% experienced more than three such events. The prevalence of PTSD trebled after 12 months when the soldiers returned to Germany (from 0.9 to 2.9%), and the risk of PTSD was higher among groups of soldiers who had served in Afghanistan than the other group.

A systematic review investigated the risk factors that predict post-traumatic stress symptoms (PTSS) among ambulance personnel. From 18 papers, the review found that several factors may contribute to PTSS including dysfunctional coping styles, organisational stress, proximity and nature of critical incidents with direct threats, deaths of colleagues, exposure to verbal or physical assault, and handling psychiatric-related cases (Brooks and Brooks, 2021).

There is thus evidence that traumatic events as a risk factor play an essential role in PTSD for first responders and ambulance personnel. However, there is a lack of cross-cultural research into the experiences of critical incidents between ambulance personnel in developed and developing countries. Such a cross-cultural study may provide helpful data to explain the differences in the prevalence rates of PTSD between developed and developing countries. Furthermore, cross-cultural studies may help to identify paramedics' coping strategies in each culture and appropriate support for them

1.6.2.2 Coping strategies

Several definitions of coping have been proposed, some of which link coping with physiological responses to stress. For example, Schouten and Wiepkema (1991) define coping as ‘the individual response to a stressor by which normally harmful physiological effects of this stressor are reduced’ (p.126). Other definitions have linked coping with human psychology. This includes Lazarus and Folkman's (1984, p. 141) definition of coping as ‘constantly changing cognitive and behavioural efforts to manage specific external or internal demands that are appraised as taxing or exceeding the resources of the person’. The severity of a person’s stress reaction is impacted by the individual assessment (appraisal), which is the process by which meaning is attached to events (Biggs, Brough, and Drummond, 2017), and this is the main concept of Lazarus and Folkman’s (1987) transactional theory of stress and coping (Lazarus & Folkman, 1987).

According to Lazarus and Folkman (1987), during the appraisal process, emotions are generated when events are viewed as threatening (stressors) or the consequent distress initiates coping strategies for managing emotions or attempts to directly address the stressor. Lazarus and Folkman identified two types of appraisals, namely primary appraisals and secondary appraisals. In the primary appraisal, the individual evaluates and decides whether the situation is stressful, and then (in the secondary appraisal) the person evaluates whether they have the resources or options to deal with the stressor (Lazarus and Folkman, 1987). Based on these appraisals, broadly speaking, two categories of coping strategies can be developed, namely problem-focused coping (PFC) for directly addressing stressors and emotion-focused strategies (EFC) for reducing the emotional effect of stressful events (Herman and Tetrick, 2009; Lazarus and Folkman, 1984). In this theory of coping, the purpose of coping strategies is either to manage the stressor directly (problem-focused coping, PFC) or to manage emotions that arise as a result of a stressful encounter (emotion-focused coping, EFC; Biggs et al., 2017; Lazarus and Folkman, 1984).

Coping strategies can also be classified as approach and avoidance strategies as argued by Roth and Cohen (1986). In approach coping, a person confronts the issues, gathers information, and then takes direct action (e.g., going to the doctor, discussing feeling with others), while the purpose of avoidant coping is to minimise the importance of the event in order to cope with it (e.g., denial, wishful thinking). In this classification, people cope in one way or another despite the fact that denying one type of problem and making specific plans for another are both possible (Ogden, 2022).

To reduce the number of coping strategies that need to be considered in the analytical process, Jorgensen and Dusek (1990) used a factor analysis to evaluate 12 coping scales. They found two coping factors, namely 1) ‘salutary support’, which is coping that relates to the utilisation of the social environment in a positive way such as seeking social support and speaking with family member about issues, and 2) ‘stress palliation’, which includes less beneficial coping strategies such as using alcohol and trying to minimise the importance of the problem.

Numerous studies have examined the importance of classifying coping strategies (e.g., Tummers, Bekkers, Vink, and Musheno, 2015; Zulkafaly, Kamaruddin, and Hassan, 2017); however, few studies have sought to understand how coping styles are linked with mental health in first responders, particularly ambulance personnel. For example, a study by Ogińska-Bulik and Kobylarczyk (2015) investigated the mediating role of coping strategies for stress in the association between resilience and post-traumatic growth among 80 paramedics. They found that both avoidance and problem-focused coping were associated with post-traumatic growth in paramedics and that venting and denial played a suppressive role rather than a meditative one.

A qualitative study of 22 ambulance workers investigated how paramedics described critical incidents they faced and how they coped with these incidents. The study found that ambulance care professionals used different coping methods to address critical incidents such as focusing on the medical tasks, distraction, seeking conformation, and seeking support from colleagues (Loef et al., 2021). Similarly, Warren-James, Dodd, Perera, Clegg, and Stallman (2022) conducted a recent scoping interview to identify which coping strategies paramedics use. Through three studies that met the review’s inclusion criteria, they found that two studies suggested paramedics used only healthy coping strategies (e.g., self-soothing, social support, relaxation or distraction, and professional assistance), and the third study found that paramedics used unhealthy coping strategies (e.g., negative self-talk, drinking alcohol, and social withdrawal).

Although there are differences among these studies in design, methodology, and assessment tools among these studies, most have found that unhealthy coping

strategies such as avoidance, numbing, and seeking support are associated with poorer mental health and PTSD symptoms. However, the relationships between coping styles and PTSD has not yet investigated for ambulance personnel in developing countries, which has a high prevalence rate of PTSD among first responders. Therefore, this thesis attempts to fill the knowledge gap by investigating the relationship between PTSD symptoms and Saudi ambulance personnel's coping strategies.

1.6.2.3 Social support

The concept of social support was first introduced in the mental health literature but has also been widely used in the physical health literature (House, Landis, and Umberson, 1988). One definition of social support is that it refers 'to the mechanisms by which interpersonal relationships presumably protect people from stress' (Kessler, Price, and Wortman, 1985, p. 541). Another definition provided by Cohen (2004) states that social support is 'the social resources that persons perceive to be available or that are actually provided to them by non-professionals in the context of both formal support groups and informal helping relationship' (p.4). Furthermore, Nelles, McCaffrey, Blanchard, and Ruckdeschel (1991) define social support by precisely identifying its sources as 'functions performed for an individual under stress by significant others such as family members, friends, or professionals' (p.22). According to Baruch-Feldman, Brondolo, Ben-Dayan, and Schwartz (2002), there are two sources of social support: 1) worksite sources, including co-workers, immediate supervisors, and unit supervisors, and 2) personal sources, including family and friends.

Helgeson (1993), identified two types of social support: 1) perceived social support which is normally assessed by asking individuals to what extent they believe that social support is available, and 2) received social support can be determined by direct observation or, more commonly, by asking individuals whether specific supportive acts have taken place, such as a friend lending money or listening to a concern.

Previous research has focused on the structural aspects of social support and the content of support relationships (Leavy, 1983). According to Thoits (1995), structural support refers to the organisation of relationships between individuals and relates to each individual's number of relationships or social roles, the frequency with which a person interacts with various members of the network, and the density and multiplexity of relationships within the network. Functional support needs often determine what level or degree of social isolation/integration the individual is experiencing or how integrated they are in society. Both types measure different content of support. Structural measures of support evaluate the existence and interconnectedness of

various social relationships such as the number of siblings while functional measures examine the particular functions of social relationships such as providing emotional or informational support (Uchino, Cacioppo, and Kiecolt-Glaser, 1996). Brugha (1995) has identified three characteristics to be considered when measuring support, namely 1) the support type including the amount received and satisfaction with it; 2) the sources of support such as family members, friends, or organisations; and 3) the function of support such as emotional support.

The association between social support and traumatic events among ambulance personnel had been investigated in the literature. For instance, among first responders, Prati and Pietrantoni (2010) examined the role of received and perceived social support in promoting mental health in their meta-analytic review. From 37 empirical studies included in their meta-analysis, they found that social support was significantly linked to the mental health of first responders, including ambulance personnel. Furthermore, the moderator analysis indicated that perceived social support was significantly higher than received social support among this population.

In order to predict symptomatology of PTSD, fatigue, and burnout resulting from acute and chronic work-related stressors, Van der Ploeg and Kleber (2003) conducted a longitudinal study on 123 paramedics. They found that lack of social support from supervisors and colleagues, and poor communication between colleagues were the strongest predictors of symptomatology.

Shakespeare-Finch, Rees, and Armstrong (2015) conducted another study to examine the effects of self-efficacy and social support on psychological well-being, post-traumatic growth (PTG), and symptoms of PTSD using an online questionnaire completed by 60 emergency medical dispatchers (EMDs). The results show that receiving social support was a significant positive predictor of both well-being and PTG and a significant negative predictor of PTSD. These findings suggest that social support may play a significant role in improving well-being and that paramedics who receive social support are more likely to be able to cope with trauma positively after traumatic incidents.

More recently, another study explored the impact of work-related stressors, psychological distress, and social support on 125 New Zealand ambulance personnel (Reti, de Terte, and Stephens, 2022b). This study found that depression and PTSD symptoms were predicted by perceived social support, whereas neither type of psychological distress was predicted by received social support. Moreover, among all three sources of support (spouse/family, colleagues, and supervisors), perceived support was mildly associated with received support. Furthermore, the study found

that social support had no significant effect on the association between direct traumatic exposure and PTSD symptoms (Reti, 2021).

It is clear from the above research that social support is an important factor affecting the mental health of ambulance personnel. However, there is a lack of studies investigating this relationship among paramedics in developing countries where the prevalence of PTSD is high among paramedics and first responders (Berger et al., 2012).

1.7 Theoretical accounts of PTSD

Several early theories were intended to provide a theoretical account of PTSD, and each theory focused on a specific aspect of PTSD. Brewin and Holmes (2003) classified these early theories into three main categories. First, social-cognitive theories such as stress response theory (Horowitz, 1993) and shattered assumptions theory (Janoff-Bulman, 1985) focus on how trauma breaches existing mental structures and on innate mechanisms to reconcile new and old information. This means that because they breach existing mental structures, trauma memories actively enter into consciousness as intrusions, flashbacks, and nightmares (Horowitz, 1993). Social cognitive theories have provided useful explanations of how a variety of beliefs and emotions are impacted by trauma and the process of adjustment (Brewin and Holmes, 2003). Second, the general idea of conditioning theories such as learning theory behaviour (Mowrer, 1960) is that the traumatic event is stored in a way that prevents the person's recovery from trauma and PTSD (Nijdam and Wittmann, 2015). Third, information processing theories are cognitive theories which focus on the trauma itself rather than the personal and social circumstances of the trauma such as the cognitive action theory of PTSD (Chemtob, Roitblat, Hamada, Carlson, and Twentyman, 1988). However, there was few published research at that time on trauma, memory, and PTSD, so all these early theories had limitations (Brewin and Holmes, 2003). Therefore, recent theories have emerged, supported by many clinical researchers, for the treatment of post-traumatic stress disorder. Three of these theories were widely discussed by Brewin and Holmes (2003), namely the theories of emotional processing, dual representation, and the cognitive model.

1.7.1 Emotional processing theory

Foa and Kozak (1986) first developed emotional processing theory by adopting Lang's (1979) bioinformatic theory 'principles of fear', which describes fear in memory as structures that include stimulus, response, and meaning elements as a program designed to avoid or escape from danger. Foa and Kozak suggest that PTSD can be constructed as reflecting a fear memory that contains erroneous associations and

evaluations, which is similar to other anxiety-based disorders (Rauch and Foa, 2006). Foa and Rothbaum (1998), who were particularly focused on PTSD symptoms in assault and rape victims, further developed this theory. One of their developments was to clarify the link between PTSD and knowledge available before, during, and after trauma. They suggest that people with strong and rigid (either positive or negative) views before trauma are more vulnerable to PTSD, which may lead to a negative appraisal of trauma reactions and increasing feelings of incompetence. Another development was an increased focus on negative appraisals of responses which may lead to exacerbated perceptions of incompetence. Foa and her colleagues assumed that perceived incompetence with the danger of traumatic events could cause chronic PTSD.

Emotional processing theory is a useful framework for understanding several important aspects of PTSD, including the importance of belief rigidity in exacerbating traumas regardless of positive or negative beliefs. Moreover, this theory is associated with prolonged exposure therapy, which is a highly effective treatment for PTSD (Powers, Halpern, Ferenschak, Gillihan, and Foa, 2010; Schneier et al., 2012).

1.7.2 Dual representation theory

According to the theory, the details of some traumatic events such as smell, sounds, and scenes are saved in the SAM system. Thus, flashbacks tend to be more detailed and emotional than ordinary memories (Moss, 2016). When individuals have experienced a traumatic event, they may attempt to dissociate from the event by, for example, distracting themselves from memories of the event to reduce negative feelings. The dual representation theory proposes that treatment for PTSD should consist of augmenting and strengthening verbally coded trauma memories with focused attention to enable them to better compete with sensory memories for retrieval. The updated version of the dual representation theory has replaced the term SAM with the term ‘sensation-near representation’ (S-reps), which means that when PTSD patients experience flashbacks, they may feel as if the event is occurring in the present moment (Brewin and Burgess, 2014; Brewin, Gregory, Lipton, and Burgess, 2010).

1.7.3 Ehlers and Clark’s cognitive model

In their cognitive theory, Ehlers and Clark (2000) suggest that the development of PTSD is driven by negative appraisals of what has happened. In their view, PTSD is caused by excessively negative thought about external threats, meaning viewing the world as dangerous, and internal threats, meaning considering the self-incompetent (Bisson, 2009). Ehlers and Clark have identified a wide range of related negative appraisals. Some reflect an overgeneralisation of danger or a judgment of their

actions, and some reflect a sense of guilt or shame. Other appraisals focus on the consequences of the event, others' reactions, and prospects of life. Patients with PTSD report experiencing a variety of emotions as a result of these different types of appraisal that may involve danger, loss, or violation of standards by others (Bisson, 2009; Brewin and Holmes, 2003).

There is general agreement among all three theories—emotional processing, dual representation, and the cognitive model—that reliving can provide benefits such as the elaboration and contextualisation of the trauma memory (Brewin and Holmes, 2003).

Overall, all recent theories, namely emotional processing (Foa and Rothbaum, 1998), dual representation theory (Brewin et al., 1996), and the cognitive model (Ehlers and Clark, 2000) can be used to understand PTSD by presenting a variety of concepts and data associated with PTSD such as memory encoding, alterations in memory functioning, appraisals, cognitive style, the role of prior beliefs, and trauma exposure.

1.8 Effective Interventions for PTSD

Various psychological interventions have been developed to treat the symptoms of PTSD in the general population. These interventions include Eye Movement Desensitisation Reprocessing therapy (EMDR) which is defined as an eight-phase treatment method including history taking, client preparation, target assessment, desensitization, installation, body scan, closure, and re-evaluation of treatment effects (Wilson, Silver, Covi, and Foster, 1996), and Trauma-Focused Cognitive Behaviour Therapy (TF-CBT). TF-CBT is an intervention aimed at improving emotional and cognitive regulation, helping adults and children understand trauma experiences, and improving their emotional and cognitive regulation (McGuire, Steele, and Singh, 2021). To develop advice on treatment and management of PTSD, the National Institute for Health and Clinical Excellence (NICE, 2005) conducted a clinical literature review. This clinical review found that both TF-CBT and EMDR were more effective treatments than other interventions.

Bisson et al. (2007) used an early systematic review to examine psychological interventions used to treat PTSD symptoms. Fifteen studies were included in the meta-analysis. Bisson et al. found that TF-CBT was more effective in reducing PTSD symptoms than waiting list conditions and supportive counselling were. However, the trials included in this review had variable quality and small sample sizes. Therefore, the results of this review should be interpreted with caution. Mavranezouli et al. (2020) conducted a more recent meta-analysis of 90 trials to investigate the relative effectiveness of psychological treatments for PTSD in adults using network meta-

analysis (NMA). They found that EMDR, TF-CBT, somatic/cognitive therapy, and self-help with support had the greatest effects in reducing PTSD symptoms after treatment. This finding is in line with several previous systematic reviews (e.g., Bisson, Roberts, Andrew, Cooper, and Lewis, 2013; Cusack et al., 2016; Forman-Hoffman et al., 2018) which concluded that both TF-CBT and EMDR are effective for reducing PTSD among adults.

1.8.1 Effective interventions for PTSD in first responders

Several systematic reviews have examined the effectiveness of interventions for reducing psychological distress, particularly PTSD, among first responders. Smith, Roberts, and Mitchell (2003) reviewed 10 studies investigating interventions to treat stress and PTSD in emergency ambulance personnel. They found that the most frequently evaluated intervention in these groups was critical incident stress debriefing (CISD). However, they suggested that their findings were not generalisable and no preference for a specific intervention due to all included articles were classified as lacking quality due to methodological issues such as insufficient sample sizes, low response rates, and bias in sampling.

Haugen, Evces, and Weiss (2012b) conducted another systematic review to examine the treatment of PTSD among first responders. They found 17 studies; 13 were case or observational studies, and only two used a randomised controlled design to treat PTSD. Their results indicated that both RCTs produced significant large treatment effects. However, given the low-quality designs of most of the included studies, these findings must also be interpreted with caution.

In their systematic review, Alden et al (2020), assessed the effectiveness of interventions to improve PTSD symptoms in first responders. They found 21 studies that included a range of psychological treatment interventions, including TF-CBT, EMDR, and Brief Eclectic Psychotherapy BEP. Their findings suggested that TF-CBT can be effective for first responders, though their studies were limited by small sample sizes and the lack of studies with control groups.

Similarly, in their systematic review, Winders et al. (2020) investigated the prevention and treatment of psychiatric symptoms among first responders. Among the 25 studies included for in-depth analysis, Winders et al. found that 18 studies had assessed the effectiveness of a psychological intervention, 13 showed a positive impact, 4 showed no impact, and 1 demonstrated worsened symptoms as a result of the intervention.

Recently, Bahji, Di Nota, Groll, Carleton, and Anderson (2021) conducted a systematic review and meta-analysis to investigate the effectiveness of psychotherapy for post-traumatic stress injuries among public safety personnel. After identifying eight included

studies (three of which are RCTs), they found that psychological interventions significantly reduced symptoms related to PTSD, anxiety, and depression, but they did not include that any one intervention was more effective than others.

Previous reviews have shown that there are few high-quality studies which investigate the effectiveness of psychological interventions to treat PTSD, and thus it is difficult to produce conclusive results based on the outcome of any study in isolation. To date, systematic reviews have usually included only very small numbers of controlled studies, and it has therefore been difficult to establish the effectiveness of psychological interventions. Furthermore, no studies or reviews have systematically examined the potential differential effects of some types of interventions in treating PTSD in first responders or ambulance personnel. Therefore, this thesis aimed to address these limitations by conducting a systematic review and meta-analysis to assess controlled studies of the effectiveness of interventions used to treat PTSD and other aspects of mental health in first responders, and to examine whether one intervention may be more effective than others.

1.9 Paramedics in Saudi Arabia

While there is a growing body of research investigating PTSD and mental health outcomes in paramedics in developed countries, fewer studies have focused on developing countries and very little research has been conducted in Saudi Arabia. Furthermore, there is a lack of studies comparing ambulance personnel in developed countries with those in developing countries. Therefore, this thesis will focus on ambulance personnel in Saudi Arabia as a developing country and will offer some comparison and discussion in relation to ambulance personnel in the UK as a developed country.

The Kingdom of Saudi Arabia is the largest country in the Middle East with an area of 2,240,000 sq. km (Al Mutairi et al., 2016) and a total population of 34,218,169 living in the following 13 regions: Makkah and Al-madenah (in the West); Albaha, Aseer, Jazan, and Najran (in the South); Hail, Aljouf, Tabouk, and the Northern Borders Region (in the North), the Eastern area (in the East), and Qaseem and Riyadh (in the middle). Each region includes a number of governorates (GAFS, 2022). People between the ages of 15 and 50 years account for 60% of the population. As a Gulf Cooperation Council (GCC) country, Saudi Arabia can be classified as a high-income developing country according to its income level in the World Bank classification. It shares characteristics with other developing countries such as challenges in healthcare delivery (Alkhamis, Hassan, and Cosgrove, 2014). Historically, Saudi Arabia has been regarded as the centre of Islam because the Qiblah in Mecca has

been the place of Prophet Mohammed's message for over 1,400 years in Medina. Therefore, many Muslims travel to Saudi Arabia to perform Hajj (as pilgrims once per year) and Umrah (as visitors at any time; Alazmy, Samarkandi, and Williams, 2020).

Emergency medical services (EMS) in Saudi Arabia are provided by the Saudi Red Crescent Authority (SRCA), which is a national agency established by the royal order in 1963 that became the 91st member of the International Red Crescent Societies league three years later in 1966 (Al Mutairi et al., 2016). Unlike for many other public safety agencies in Saudi Arabia, there is a dedicated emergency number for the SRCA (997), and it is fully funded by the government (Khattab et al., 2019). According to the General Authority for Statistics (2019), the SRCA's annual budget is more than USD 467 million annually. It has 9,015 staff members including 193 doctors, 655 health assistants, 3 pharmacists, 1,198 administrative staff, 6,239 technicians and specialists, and 727 workers. Approximately 1,392 ambulance and service vehicles are available across 505 stations in all Saudi areas (Al Mutairi et al., 2016; Al Shammari et al., 2017; SRCA, 2021). In 2021, the SRCA responded to 77,8791 emergency cases throughout the Saudi cities (SRCA, 2021).

The psychological health of Saudi paramedics is adversely affected by a number of administrative, psychological, and cultural challenges. The most prominent of these challenges are the absence of organizational support, conflict with patients' families, and a lack of community awareness of emergency services (AlShammari et al., 2017; Khan et al., 2020).

Each year, large numbers of pilgrims (around two million) visit Mecca for religious purposes. Every Muslim adult who is physically and financially capable must perform Hajj at least once in their lifetime (Memish et al., 2009). Every year, the Hajj takes place in Mecca during the 12th month of the Islamic calendar and lasts 5-7 days. Over two million pilgrims gather every year from approximately 160 countries in the (Mena) region for the annual Hajj which is one of the largest and most diverse mass gatherings in the world (Ziad A Memish, Venkatesh, and Ahmed, 2003).

In last ten years, the Saudi government has served nearly 24 million pilgrims (General Authority for Statistics, 2017). However, the Saudi government is responsible for all events during the Hajj season in terms of security and health through the participation of all military and health services in order to ensure the safety and health of pilgrims until they return home. Pilgrims are in close proximity because of the packed and crowded accommodations, congregation, and prayers, creating an ideal environment for infectious disease transmission and spread (Madani et al., 2007). According to Al-Masud, Bakar, and Yussof (2016), a lot of pilgrims suffer injuries, feel tired, sick, and exhausted due to the hardships of travel, changing the weather conditions, and

continuous walking during religious rites at specific times and places. In 2022, the number of emergency services reached 111676 cases in Makkah and Madinah (SRCA, 2021). Moreover, in Hajj season, there have been several unfortunate events that have occurred, for instance, the victims of crowding and stampede, and killing and stabbing pilgrims as terrorist acts (Alaska, Aldawas, Aljerian, Memish, and Suner, 2017; Khan and Noji, 2016). Therefore, there is high pressure on ambulance personnel to deliver rapid assessment, timely treatment, and immediate transfer to the nearest appropriate facility.

Another factor that increases stress for Saudi paramedics is the high number of traffic accidents in Saudi Arabia. Saudi Arabia has the highest rates of road deaths and injuries among all high-income countries (WHO, 2018). In the last two decades, Saudi Arabia has reported 86,000 deaths and 611,000 injuries in road traffic accidents, with 7% of these injuries resulting in permanent disabilities. Almost 19 people are killed in car accidents every day, and four are injured every hour (Mansuri, Al-Zalabani, Zalat, and Qabshawi, 2015). All these accidents are handled by ambulances either rescuing and transporting the injured people to hospitals or transporting dead bodies. Moreover, the SRCA reported that in 2019, traffic accidents were the most common cases Saudi paramedics treated (SRCA, 2021).

Working long hours is another reason paramedics experience high levels of stress in Saudi Arabia. Compared to paramedics in other countries, Saudi ambulance personnel work longer hours. For instance, a comparison survey study was conducted to investigate the prevalence of sleep and mental health disorders among paramedics in Saudi Arabia and Australia. The study found that the average working hours of Saudi paramedics were higher (48.3 hours per week) than those of their peers in Australia (45.5 hours per week), and this factor explained the highest scores in depression and PTSD among Saudi paramedics (Khan et al., 2020). According to Min, Min, and Hong (2019), working more than 40 hours of a rotational shift system per week may lead to sleep problems and increase fatigue among health providers.

While some studies and reviews have shown that interventions are effective, others have reported that the benefits of the interventions are not significant (Anderson, Di Nota, Groll, and Carleton, 2020; Kleim and Westphal, 2011; Roberts, Kitchiner, Kenardy, and Bisson, 2010). Moreover, more information is needed to investigate the difference in the prevalence of PTSD among ambulance personnel between developed and developing countries. Furthermore, the significant increase in the prevalence of PTSD among paramedics in developing countries urgently requires further investigation. There is a need for studies to examine the reasons for the

increase and understand the factors that may have a role in increasing these symptoms such as daily events, coping strategies, and social support.

1.10 Thesis aims

The purpose of this chapter was to review relevant literature on PTSD among first responders and explain how particular factors may increase or decrease risk of PTSD symptoms in this population. Several gaps were identified in the literature, including a lack of consensus on the effectiveness of interventions to reduce PTSD among first responders and ambulance personnel, the need for cross-cultural investigation of the impact of traumatic work events on ambulance personnel in developed and developing countries and to explore how they cope, and the need to examine potential reasons for high rates of PTSD among paramedics in Saudi Arabia. Based on these gaps, this thesis intended to:

1. Investigate which, if any, psychological interventions are effective for reducing PTSD symptoms and psychological distress in first responders.

2. Understand the impact of potentially traumatic events on Saudi and UK ambulance personnel.

3. Explore the types of coping strategies Saudi and UK ambulance personnel use in response to traumatic events.

4. Identify the types of support preferred by Saudi and UK ambulance personnel.

5. Establish the prevalence rates of PTSD symptoms among Saudi ambulance personnel.

6. Understand if and how coping strategies and social support perceptions are associated with PTSD symptoms among Saudi ambulance personnel.

7. Ascertain the strength of the association between daily incident exposure, coping styles, and social support and daily levels of PTSD symptoms among Saudi ambulance personnel.

1.11 Thesis overview

To achieve the aims of this thesis, four studies were conducted, which are reported in each of the subsequent chapters.

Chapter 2 relates to aim 1. A systematic literature review and meta-analysis were conducted to synthesise research that has examined the effectiveness of

psychological interventions for treating post-traumatic stress disorder (PTSD), anxiety, depression, stress, and burnout in first responders. I included other mental health outcomes because PTSD is closely associated with other mental health disorders. For instance, some studies indicate that anxiety and depression are often secondary to PTSD symptoms (e.g., Brady, Killeen, Brewerton, & Lucerini, 2000; Ginzburg, Ein-Dor, & Solomon, 2010). The meta-analysis included intervention studies that used randomised controlled trial (RCTs) designs or controlled before-after designs (CBAs) to treat or reduce PTSD, depression, anxiety, stress, and burnout in first responders. Moreover, the meta-analysis compared the effectiveness of different types of interventions (cognitive behaviour therapy [CBT] versus other interventions, clinician-delivered versus non-clinician-delivered interventions, and individual-based versus group-based interventions) for reducing symptoms of PTSD, depression, anxiety, stress, and burnout.

Chapter 3 relates to aims 2,3, and 4. A qualitative cross-cultural study was conducted to investigate the lived experience of potentially traumatic work events among Saudi and UK ambulance personnel. For this study, semi-structured interviews containing open-ended questions were conducted with ambulance personnel from Saudi Arabia (in Arabic) and the UK (in English). The data were analysed using thematic analysis. The results of this study informed the development of the research questions which were addressed in the next chapter.

Chapter 4 relates to aims 5 and 6. A cross-sectional survey was conducted to examine the prevalence rate of PTSD symptoms in Saudi ambulance personnel. The study also explored whether passive and active coping strategies and social support were associated with symptoms of PTSD. The findings of this study informed the final study in Chapter 5.

Chapter 5 relates to aim 7. A daily diary method was used to determine whether daily symptoms of PTSD are associated with daily incidents, coping styles, and social support among Saudi ambulance personnel. The purpose of this chapter was to explore the role of daily traumatic events with PTSD symptoms and the factors which may influence this relationship (Beaton & Murphy, 2013).

Chapter 6 summarises all the previous studies to provide an overview of the associations between PTSD symptoms and traumatic incidents, coping strategies, and social support among Saudi ambulance personnel. The implications of these findings for ambulance personnel and EMS organisations are discussed in this chapter along with suggestions for future research in this field.

Chapter 2 The effectiveness of psychological interventions for reducing PTSD and psychological distress in first responders: A systematic review and meta-analysis

This review has been published in PLOS ONE (24th August 2022): Alshahrani K.M, Johnson J, Prudenzi A, O'Connor D.B. (2022) The effectiveness of psychological interventions for reducing PTSD and psychological distress in first responders: A systematic review and meta-analysis. PLoSONE17(8): e0272732.

2.1 Introduction

The term first responders has been used extensively in the literature to refer to a range of professions and occupations such as firefighters, police officers and paramedics(Bricker, Petermann, Hines, and Sands, 2013; Haugen, Evces, and Weiss, 2012b; Prati and Pietrantoni, 2010). These professions are considered by many as the 'traditional' first responders (Benedek, Fullerton, and Ursano, 2007; Greinacher, Derezza-Greeven, Herzog, and Nikendei, 2019). However, there has been debate in the scientific and medical literature about which groups are classified as first responders (Benedek et al., 2007). For example, a number of studies have included 911 operators or dispatchers, correctional workers, nurses, physicians, public safety personnel and have drawn a distinction between 'traditional' and 'untraditional' first responders (Benedek et al., 2007; Carleton et al., 2019). Other studies have investigated risk workers which contain traditional and untraditional first responders, including public safety personnel and frontline healthcare professionals (Di Nota, Bahji, Groll, Carleton, and Anderson, 2021). Nevertheless, recognising these definitional differences, the current research was interested in focussing on traditional first responders who respond to accidents or disasters in the early phases to protect and preserve life, property, and the environment; they include police officers, firefighters, search and rescue personnel, and emergency and paramedic teams (Prati and Pietrantoni, 2010).

Although the specific roles of different groups of first responders varies, they all face multiple potentially psychologically traumatic incidents in their daily work which puts them at heightened risk of experiencing mental health difficulties and disorders including posttraumatic stress disorder (PTSD), depression, anxiety and burnout (Basinska, B. A., and Wiciak, 2012; Bentley, Crawford, Wilkins, Fernandez, and Studnek, 2013; Sterud, Hem, Ekeberg, and Lau, 2008). In particular, first responders are more frequently exposed to potentially psychologically traumatic events than the general population, sometimes causing them to become 'secondary traumatic victims' (American Psychiatric Association, 2013b; Jacobs, Horne-Moyer, and Jones, 2004; S.

Jones, 2017). Recent reviews have estimated the prevalence of PTSD and other psychological disorders among these populations. Petrie et al (Petrie et al., 2018) found prevalence rates in paramedics were 11% for PTSD, 15% for depression, 15% for anxiety, and 27% for general psychological distress. Other reviews have reported prevalence rates ranging between 6.4% to 57% for firefighters, and 5.8% to 19.6% for police officers (Carleton et al., 2018; Syed et al., 2020). As such, there is a pressing need to better understand the mental health of first responders and to identify efficient and appropriate interventions that are suitable for delivery to these groups. Due to the nature of their work, there is also a particular need to understand the effectiveness of interventions for helping to reduce PTSD symptoms in first responders.

In the last two decades, five systematic reviews have attempted to synthesize the effectiveness of interventions for reducing psychological distress among first responders, especially PTSD (Alden et al., 2020; Anderson, Di Nota, Groll, and Carleton, 2020; Haugen et al., 2012; Smith and Roberts, 2003; Winders et al., 2020). Smith and Robert (Smith and Roberts, 2003) identified a range of studies that tested interventions to reduce stress and PTSD among emergency ambulance personnel, and they found that all included articles (10 studies) had a lack of quality due to their methodological flaws such as, self-selection of groups and inadequate timing of the interventions. Haugen and his colleagues (2) reviewed papers that treated PTSD in first responders, and they found 17 articles but only two randomized controlled trials (RCTs). Alden et al.(Alden et al., 2020) evaluated the effectiveness of interventions targeting posttraumatic symptoms in first responders. They identified 21 studies and 8 of them were RCTs. They found that trauma focused therapies can be effective for first responders, but faced some limitations such as, the small sample sizes of most included studies, and few investigations with any control condition. Winders et al. (Winders et al., 2020) examined the prevention and treatment of psychiatric symptoms in first responders and how effectiveness was related to the income level of the country. They found, in 25 eligible studies, that most interventions were effective for preventing and treating psychological illness in first responders in all three levels of income countries. Another relevant review was conducted by Anderson et al. (2020) in frontline healthcare and public safety personnel. They reported inconsistent evidence regarding the effectiveness of organizational peer-support and crisis-focused psychological interventions for reducing PTSD symptoms but highlighted the need for further studies. However, a recent meta-analysis was published in 2021 (Bahji, Di Nota, Groll, Carleton, and Anderson, 2021) that examined the effectiveness of psychotherapy for posttraumatic stress injuries among public safety personnel. They found, by identifying 8 included studies, these interventions were associated with significant reductions in PTSD, anxiety, and depression symptoms.

Overall, three limitations are evident in the existing literature into interventions for psychological distress among first responders. First, controversy about the importance and effectiveness of interventions remains. While some studies and reviews have suggested that interventions are highly effective, others have reported no significant benefit of interventions (Anderson et al., 2020; Kleim and Westphal, 2011; Roberts, Kitchiner, Kenardy, and and Bisson, 2010). Second, there appears to be a lack of high-quality intervention studies, and as such it is hard to draw firm conclusions based on the results of any study in isolation. Three, it is possible that some types of interventions are more effective than others, however, no studies or reviews have carefully investigated these potential differential effects. Cognitive Behaviour Therapy (CBT) and Eye Movement Desensitization and Reprocessing (EMDR) have been found to be effective in treating mental health disorders in both general clinical populations (American Psychiatric Association, 2013a) and first responders (Ignacio, Amaya, Givaudan, and Alaide, 2013), but there is a great deal of debate about the possible benefits of other interventions such as critical incident stress debriefing (CISD) (Jacobs et al., 2004). In addition, previous meta-analyses have not compared the effectiveness of clinician delivered versus non-clinician delivered interventions or individual-based versus group-based interventions. In order to address these limitations, it was decided that a systematic review and meta-analysis were needed to assess the effectiveness of interventions used to treat PTSD and other aspects of mental health in first responders. The moderating effects of gender and age were also examined given that previous research has found that females and older workers have reported higher rates of PTSD compared to males and younger workers, respectively (Berger et al., 2012). In addition, a number of important other methodological moderating factors were also explored (i.e., risk of bias, sample size, number of sessions and length of interventions).

2.2 Aims and objectives

The first aim of the current review was to synthesise the evidence for the effectiveness of psychological interventions for improving mental health symptoms in first responders. Our primary outcome of interest was PTSD symptoms; secondary outcomes were depression, anxiety, stress, and burnout. Our second aim was to compare the effectiveness of different types and formats of interventions (CBT versus other interventions, clinician delivered versus non- clinician delivered interventions and individual-based versus group-based interventions) for reducing symptoms of PTSD, depression, anxiety, stress, and burnout.

2.3 Method

This systematic review was registered in advance on PROSPERO, after specifying the inclusion criteria and analytical methods: CRD4MASKED. https://www.crd.york.ac.uk/prospero/display_record.php?ID=MASKED. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines that can be found in Appendix 1.

2.3.1 Search strategy

Four electronic databases were searched: EMBASE, PsycInfo, CINAHL, and Cochrane Register of Controlled Trials- from inception to June 2nd 2019, updated to September 8th 2021. The search strategy was performed by using three key blocks of terms: “interventions”, “first responders” and “posttraumatic stress disorder” or “depression” or “anxiety” or “burnout” or “stress”. Also, MeSH and keyword terms were examined based on terms usually used within previous reviews in the fields of first responders and PTSD (see eMethods.1) (Berger et al., 2012; R. Jones et al., 2002; Kaplan, Bergman, Christopher, Bowen, and Hunsinger, 2017; Stergiopoulos, Cimo, Cheng, Bonato, and Dewa, 2011; Sterud, Ekeberg, and Hem, 2006).

2.3.2 Eligibility criteria

The eligibility criteria were:

- Population: Studies that looked at first responders who work at the sites of critical incidents including police officers, firefighters, search and rescue personnel, and emergency and paramedic teams. We included any studies focused on these groups, including those with and without any pre-existing mental health diagnoses.
- Intervention: Studies with an individual or group psychological intervention designed to reduce PTSD, anxiety, depression, burnout, and/or stress symptoms that were delivered by registered clinicians (e.g., psychologists or psychiatrists) and non-clinicians (e.g., experiences police officers or supervisors).
- Comparison: Any type of control group (e.g., no intervention, alternative intervention, or wait list) was included.
- Outcomes: The primary outcome was PTSD symptoms as rated by an observer (e.g., doctor or researcher) using validated scales such as PTSD checklist (Blanchard, Jones-alexander, Buckley, and Forneris, 1996) or self-reported PTSD symptoms measured using validated scales such as, PTSD symptoms scale self-report PSS-SR (Foa, Riggs, and Constance, 1993). Secondary outcomes were stress, anxiety, depression, and burnout also measured via observer ratings or self-report, using validated scales (e.g., the Hospital Anxiety and Depression

scales HADS (Zigmond and Snaith, 1983), for anxiety and depression and the Maslach Burnout Inventory MBI, (Maslach and Jackson, 1981) for burnout).

- Design: Studies that used randomized controlled trial (RCTs) designs or controlled before-after designs (CBAs), as defined in the Cochrane handbook, were included (Higgins and Green, 2008).
- Context: Studies that investigated any treatment effects of psychological interventions in the first responders that were published in the English language were included.

2.3.3 Exclusion criteria

We excluded studies conducted on other types of first responders, such as in-hospital health care workers (e.g., emergency room doctors and nurses) or military first responders (e.g., peacekeepers and soldiers). Also, all studies that used different types of interventions, such as physical or pharmacological interventions rather than psychological interventions were excluded, as were non-English language studies and grey literature.

2.3.4 Study selection

All search results from each database were exported to Endnote version X8.2 (Clarivate Analytics, Philadelphia, United State) and all duplicates were removed. The study selection consisted of two stages. In the first stage, titles and abstracts were screened based on the above criteria by one author (KA). A second author (JJ) checked and reviewed 10% of included studies. To estimate the level of agreement we calculated the Kappa score which indicated good agreement (k=0.845). In the second stage all full texts were screened by one reviewer (KA) with a second independent reviewer (AP) screening 20% of full texts, with 100% agreement.

2.3.5 Data extraction

We used Excel 2016 (Microsoft Inc, Washington) to organize a data extraction form. We extracted quantitative data for the meta-analysis on a separate Excel file. All data extraction was undertaken by KA. The first 10% of eligible articles were independently extracted by AP to check for agreement. Any discrepancies were resolved by discussion. The following descriptive information was extracted from eligible studies:

- Study: country, research design, recruitment method and content of the control condition.
- Participants: sample size, age, gender, discipline, setting.
- Intervention: content of the intervention, measurement time points.
- Outcomes: PTSD, stress, anxiety, depression and burnout.

2.3.6 Risk of bias (quality) assessment

We used the Effective Practice and Organisation of Care (EPOC) risk of bias tool (EPOC, 2014) to carry out a critical assessment, as it is suitable for use across all different types of intervention designs, as reported in Cochrane handbook (Higgins and Green, 2008). The tool comprises nine standardized criteria, each one rated on a three-point scale (0 = low risk, 1 = unclear risk, and 2 = high risk). Studies that obtained low-risk score have been considered across at least six of nine criteria to be less susceptible to risk of bias.

2.3.7 Data analysis

Comprehensive Meta-Analysis software version 3 (CMA) (Borenstein, M., and Rothstein, 2013) was used to calculate random effect sizes and other meta-analyses processes. The main meta-analysis examined the effectiveness of psychological interventions for improving PTSD in first responders. Secondary meta-analyses examined anxiety, depression, and stress interventions in same population.

We calculated the effect sizes using standardised difference of means (SDM) and associated 95% confidence intervals for PTSD, anxiety, depression, and stress outcomes in all included studies. We used post-treatment means, standard deviations (SD), and sample sizes to calculate the effect sizes between treatments and control groups. When means and SD values were not provided in the original studies, we used the available sample sizes and p-values to impute missing SDM (following the procedures outlined by Borenstein and colleagues (see Borenstein, M., and Rothstein, 2013). For studies that had two types of interventions compared to a waiting list control group, we divided the sample size of the control group in half in each type to reduce the variance related with each effect size and to avoid double counting of participants (Michie, Abraham, Whittington, and John McAteer, 2009). If studies collected more than one follow-up assessment point, we used the first assessment point following the intervention.

For comparison groups, we identified the most common type of intervention used for each outcome and compared with all other interventions. If there was no common intervention for an outcome, then the outcome was not included in subsequent analyses. In addition, we also compared between interventions according to whether they were provided by clinicians versus non-clinicians (providers) and whether they were group-based versus individual-based interventions (format).

To account for heterogeneity, a random effects model was used in all analyses and assessed with I^2 statistic (Higgins and Green, 2008). I^2 values indicate 25% as low, 50% as moderate, and 75% as high heterogeneity. In addition, between-study

heterogeneity was assessed by Cochran's Q-statistic (measure of weighted squared deviations) (Cochran, 1954). The Cochran Q test (significance level, $p < 0.05$) was used to compare between types of interventions. Specifically, the $Q_{between}$ statistic was used to examine if the SDM was significantly different between groups of interventions. Moreover, meta-regressions were used to examine the impact of any potential moderating variables on the overall effect size for different outcomes. Meta-regression follows similar principles to regression or multiple regression in primary studies, except that in meta-analyses the variables are at the level of the study and not the participant (Michie et al., 2009). Six moderating variables were investigated (risk of bias, gender, mean age, sample size, number of sessions, and total length of interventions by minutes). Sensitivity analyses were performed to: 1) examine the balance of the results among studies with a lower risk of bias rating and 2) to investigate the potential impact of outliers. Publication bias was calculated with Egger's regression test (Egger, Smith, Schneider, and Minder, 1997), and further explored using funnel plots and Duval and Tweedie's trim and fill analysis(Duval and Tweedie, 2000).

2.4 Results

A total of 4572 papers were identified by our searches. In addition, 13 papers were discovered by manual reference list scanning (see Figure 1). We removed duplicated articles, and then screened the title and abstracts of 3344 studies. 80 out of these were screened as full text. 20 papers were eligible to include in the systematic review and meta-analysis (Alghamdi, Hunt, and Thomas, 2015; Backman, Arnetz, Levin, and Lublin, 1997; Behnammoghadam, Kheramine, Zoladl, Cooper, and Shahini, 2019; Bryant et al., 2019; Carlier, Voerman, and Gersons, 2000a; Chongruksa, Parinyapol, Sawatsri, and Pansomboon, 2012; Christopher et al., 2018; Difede et al., 2007; R. S. Doctor, Cutris, and Isaacs, 1994; B. P. R. Gersons, Carlier, Lamberts, and Van Der Kolk, 2000; Ireland Malouff, J. M., and Byrne, B., 2007; Jarero, Amaya, Givaudan, and Miranda, 2013; Macnab et al., 2003; Ramey et al., 2016; Sarason, Johnson, Berberich, and Siegel, 1979; Shipley and Baranski, 2002; Skeffington, Rees, Mazzucchelli, and Kane, 2016; Tuckey and Scott, 2014; Wee, Mills, and Koehler, 1990). For articles which were eligible for the systematic review but which did not report the necessary outcome data for meta-analysis, we contacted the authors and co-authors, to request the relevant data. Five papers (Backman et al., 1997; R. Doctor, Curtis, and Isaacs, 1994; Macnab et al., 2003; Sarason et al., 1979; Shipley and Baranski, 2002) were not included in the meta-analysis because either the authors no longer had access to the data or the authors did not respond. The total number of studies included was 15 (Alghamdi et al., 2015; Behnammoghadam et al., 2019; Bryant et al., 2019; Carlier et al., 2000a; Chongruksa et al., 2012; Christopher et al.,

2018; Difede et al., 2007; B. P. Gersons, Carlier, Lamberts, and der Kolk van, 2000; Ireland, Malouff, and Byrne, 2007; Jarero et al., 2013; Ramey et al., 2016; Skeffington et al., 2016; Tuckey and Scott, 2014; Wee et al., 1990; Wild, El-Salahi, Degli Esposti, and Thew, 2020).

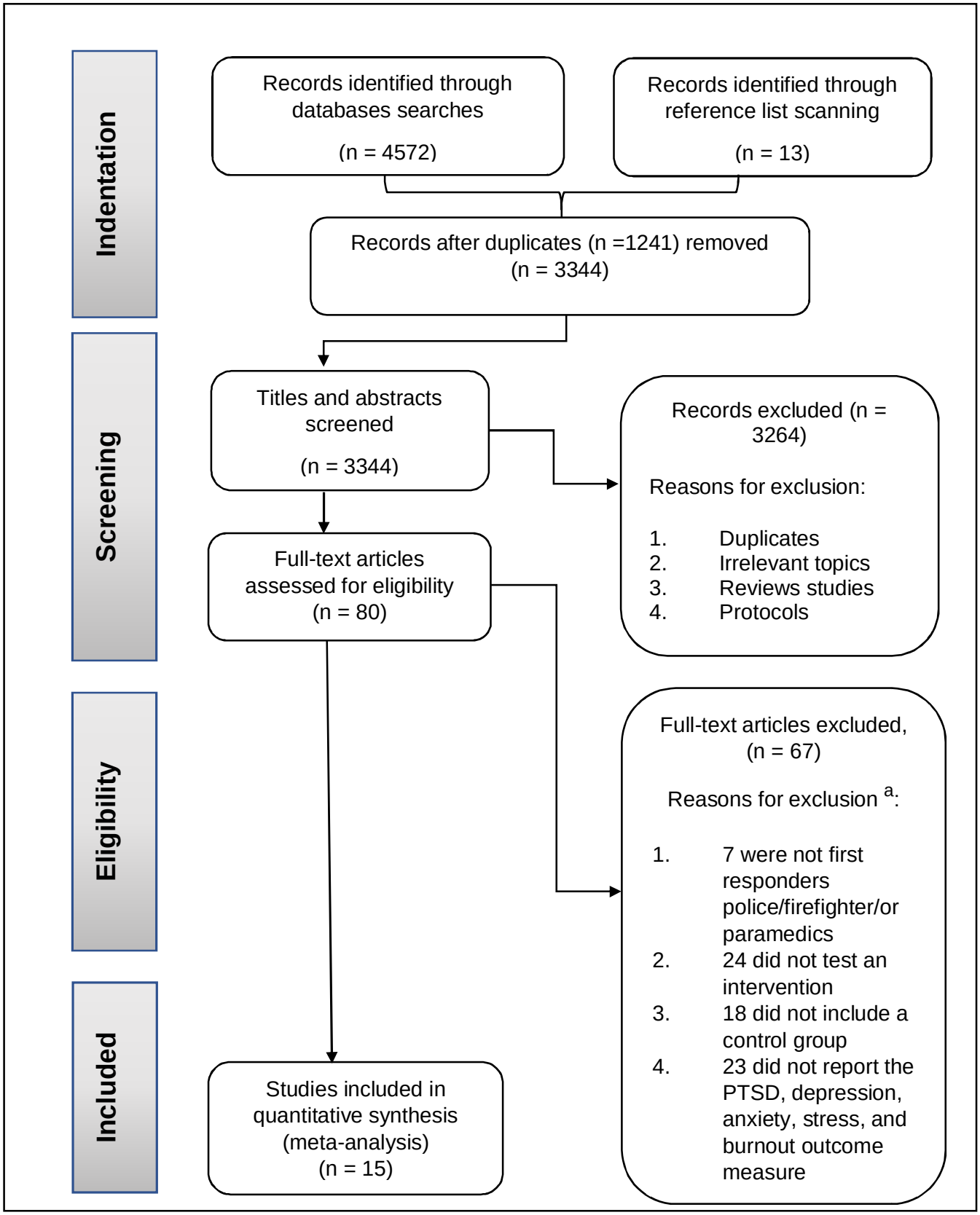


Figure 2.1 Flow diagram of article selection

2.4.1 Characteristics of the studies and participants

Across the 15 papers, the total sample size was 928 (mean age = 39.5 years, 64.8% males). 10 studies measured PTSD, 7 studies measured anxiety, 10 studies measured depression, and 7 studies assessed stress. One study evaluated burnout (this study was not meta-analysed due to there being an insufficient number of studies for meta-analysis). In terms of participants, 6 studies were conducted with police officers, 3 studies were conducted with firefighters, 2 studies were conducted with ambulance personnel, and 4 studies were conducted in a mix of disaster workers that included police officers, firefighters, and paramedics. 4 out of 15 studies were conducted in the USA, 3 in Australia, 3 in the Netherlands and one study each in England, Saudi Arabia, Iran, Thailand and Mexico.

2.4.2 Characteristics of the interventions

A range of different types of interventions was used. Cognitive behaviour therapy (CBT) was the most frequent with 4 different types of CBT used in 3 studies, then critical incident stress debriefing (CISD) and resilience training were used in 3 studies each, while eye movement desensitization and reprocessing (EMDR) was used in 2 studies, and 1 study each used brief eclectic psychotherapy, eclectic group counselling, written emotional expression, and mental agility and psychological strength. One study had more than one intervention that used 2 types of cognitive behaviour therapy (the long type (CBT-L) and brief type (CBT-B) compared to a waiting list control group (Bryant et al., 2019). The mean number of treatment sessions was 7.53, the longest individual session lasted 2.5 hours and the shortest one lasted 15 minutes (see Table 2.1). In terms of providers, two types of intervention deliverers were identified: clinician (8 studies) versus non-clinicians (6 studies), and one study (Wee et al., 1990) was not clear because there was no more details about providers or delivered type of interventions. In addition, interventions were delivered in an individual (8 studies) or group format (6 studies), and one study was not clear.

Table 2.1 Characteristics of studies, population and outcomes included in the review

First author, year	Subjects and (Numbers)	Mean age	Gender	Country	Design	Intervention	Measurements	Control	Number of sessions	time points	Length of intervention by Minutes
Alghamdi, 2015	Firefighters (34)	30.4	Males	Saudi Arabia	RCT	NET (CBT)	SPTSS and HADS	Wait list	4 sessions (90 min per session)	Before, after treatment, 3 and 6 months follow up	360 minutes in all sessions
Behnammoghada, 2019	Emergency medical technician (50)	30.8	Unclear	Iran	RCT	EMDR	Alken stress	No intervention	5 consecutive sessions, each session lasting 45-90 minutes	Unclear	340 minutes in all sessions
Bryant, 2019	Police, firefighter, and paramedics (100)	43.6	Males = 77 Females = 23	Australia	RCT	CBT-L and CBT-B	CAPS and BDI	Wait list	12 sessions were 90 minutes.	Before, after treatment and 6 months follow up	1080 minutes in all CBT_L sessions

Carlier, 2000	Police officers (243)	31	Males = 173 Females = 70	Netherlands	CBA	CISD	SRS-PTSD and IES	No intervention	Three successive debriefing sessions	Before, after treatment, 6 months follow up	The mean of all was 74.7 minutes
Chongruksa, 2012	Police officers (26)	35.6	Unclear	Thailand	RCT	Eclectic group counseling	BDI-II and GHQ	Mental health psychoeducation	12 sessions each session lasting approximately 82 min	Before, after treatment and 1 month follow up	984 minutes in all sessions
Christopher, 2018	Police officers (61)	44	Males = 54 Females =7	USA	RCT	MBRT	PROMIS measures (v1.0)	No intervention	8 sessions, each session spend 2 hours	Before, after treatment and 3 months follow up	1200 minutes in all sessions
Difede, 2007	Disaster workers (21)	45.7	Unclear	USA	RCT	CBT	PCL, BDI, and SCL-90	Treatment as usual	12 sessions each session lasting 75 minutes	Before, after treatment and 3 months follow up	900 minutes in all sessions

Gersons, 2000	Police officers (42)	36.5	Males = 37 Females = 5	Netherlands	RCT	BEP	HADS	Wait list	16 sessions, each session lasting 60 minutes	Before, after treatment and 3 months follow up	960 minutes in all sessions
Ireland, 2007	Police officers (67)	38.8	Males = 39 Females = 28	Netherlands	CBA	Written emotional expression	DASS	No intervention	12 work shifts for 15 minutes each day	No follow up	180 minutes in all sessions
Jarero, 2013	Paramedics and Firefighter (39)	Unclear	Males = 20 Females = 19	Mexico	RCT	EMDR	SPRINT	counseling group	2 sessions, each session lasting 90 minutes	Before, after treatment, 1 and 3 months follow up	180 minutes in all sessions
Ramey, 2016	Police officers (38)	41.2	Males = 29 Females = 9	USA	CBA	Resilience training	IES and PSS	Wait list	Two sessions, each session lasting 7.5 h	Unclear	900 minutes in all sessions

Skeffington, 2016	Firefighters (75)	28.8	Males = 71 Females = 4	Australia	RCT	The Mental Agility and Psychological Strength	PCL-C and DASS	Received treatment as usual	4 sessions, each one lasting 1 hour	Before, after treatment, 6 and 12 months follow up	240 minutes in all sessions
Tuckey, 2014	Firefighters (67)	Unclear	Males = 61 Females = 6	Australia	RCT	CISD	IES and K-10	No intervention	3 sessions which lasting 90 minutes	No follow up. Only pre and post treatment after 1-momth	270 minutes in all sessions
Wee, 1999	Emergency medical personnel (65)	Unclear	Unclear	USA	RCT	CISD	FRI-A	No intervention	12 days with no more details	Unclear	NA
Wild, 2020	Police, ambulance, firefighter, and search and rescue (430)	41	Males = 180 Females = 250	England	RCT	Resilience intervention	PCL-5, PHQ-9, and GAD-7	Psychoeducation	6 sessions each one lasting 150 minutes	Before, after treatment with 3 months follow up	900 minutes in all sessions

Abbreviations: **NA**, indicates not available; **RCT**, Randomized Controlled Trials; **NET**, Narrative Exposure Therapy; **SPTSS**, Scale of Posttraumatic Stress Symptoms; **HADS**, Hospital Anxiety and Depression Scale; **CBA**, Controlled before-after study; **IES**, Impact of Events Scale; **BEP**, Brief Eclectic Psychotherapy; **CAPS**, Clinician Administered Posttraumatic stress disorders Scale; **BDI**, Beck Depression Inventory; **CISD**, Critical Incident Stress Debriefing; **SRS-PTSD**, Self-Rating Scale for Posttraumatic stress disorders; **MBRT**, Mindfulness-Based Resilience Training; **BDI-II** , Beck Depression Inventory-Second edition ;**GHQ**, General Health Questionnaire; **CBT**, Cognitive

behavioural Therapy; **PCL**, PTSD Checklist; **PHQ-9**, Patient Health Questionnaire; **GAD**, Generalised Anxiety Disorder questionnaire; **SCL-90**, Symptom Checklist 90; **DASS**, Depression Anxiety Stress Scales; **PSS**, Perceived Stress Scale; **. K-10**, Kessler-10; **FRI-A**, Frederick Reaction Index-Adult; **PTDS**, Posttraumatic Stress Diagnostic Scale; **PSI,** Police Stress Inventory; **JSS,** Job Stress Survey; **EMDR**, Eye Movement Desensitisation Reprocessing.

2.4.3 Risk of bias characteristics

The risk of bias was calculated using the EPOC 9 criteria. 8 studies were considered low risk, 6 studies were scored as moderate risk, and 1 study was high risk (see Figure 2.2). In addition, in 6 of the studies the comparison or control condition did not include any intervention component. Future research should endeavour to include an active control condition. Lack of blinding across studies was also a potential source of high risk of bias given that many studies did not use blinding or it was not reported clearly in the papers. Similarly, there were some concerns related to lack of allocation concealment and missing data.

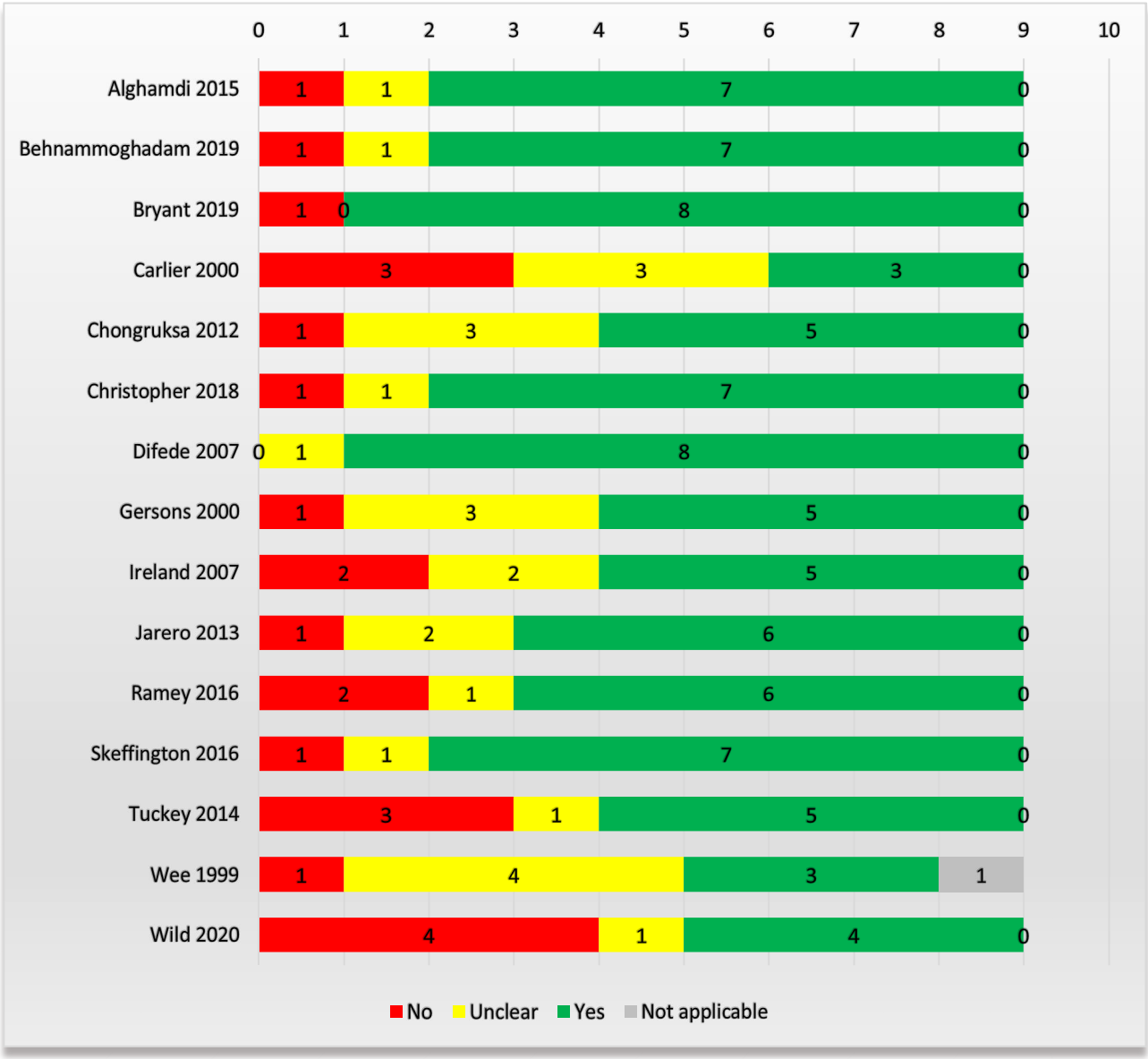


Figure 2.1 Ratings of studies included in the review on the 9 EPOC risk of bias criteria

2.4.4 Main and secondary meta-analysis

The main meta-analysis results found psychological interventions led to a significant reduction in PTSD and depression at p<0.01 level (10 comparisons: SDM = -0.86; 95% CI = -1.34 – -0.39; I^2 = 88.97%; Figure 2.3), (10 comparisons: SDM = -0.63; 95% CI = -0.94 – -0.32; I^2 = 72.48%; Figure 2.4) respectively, and a significant reduction in anxiety symptoms at the p<0.05 level (7 comparisons: SDM = -0.38; 95% CI = -0.71 – 0.05; I^2 = 67.12%; Figure 2.5) but no significant reduction for stress (7 comparisons: SDM = -0.13; 95% CI = -0.51 –0.25; I^2 = 71.67%; Figure 2.6). As I^2 values shown above, the heterogeneity between the studies in the PTSD analysis was high indicating the need to consider the role of potential moderators. Therefore, the following 6 moderators were considered: risk of bias, gender, mean age, sample size, session number and the length of treatments (See Table 3).

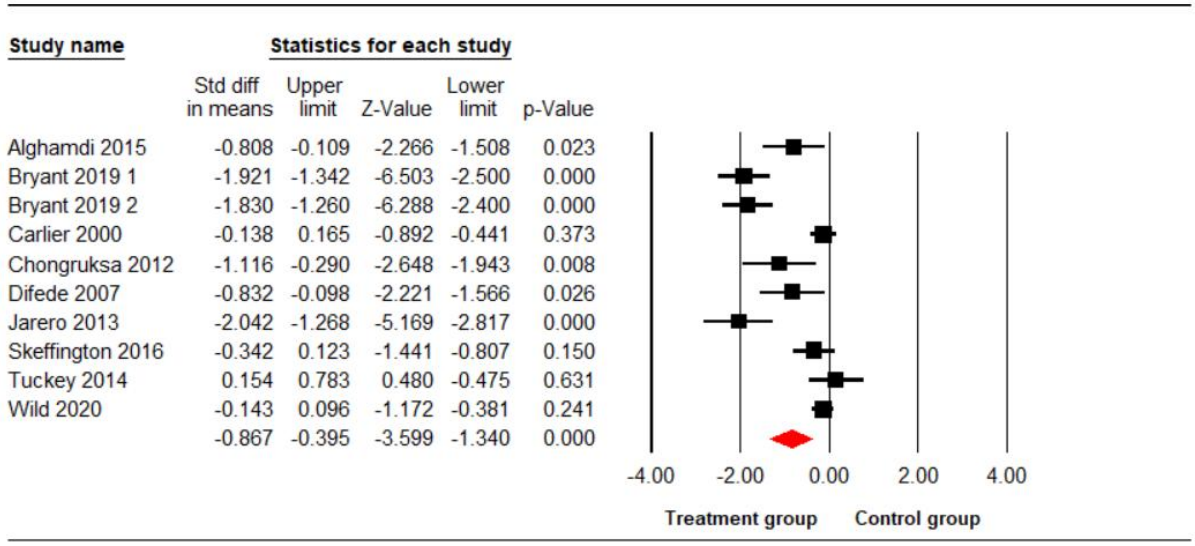


Figure 2.2 Forest plot for the effect of interventions on PTSD symptoms.

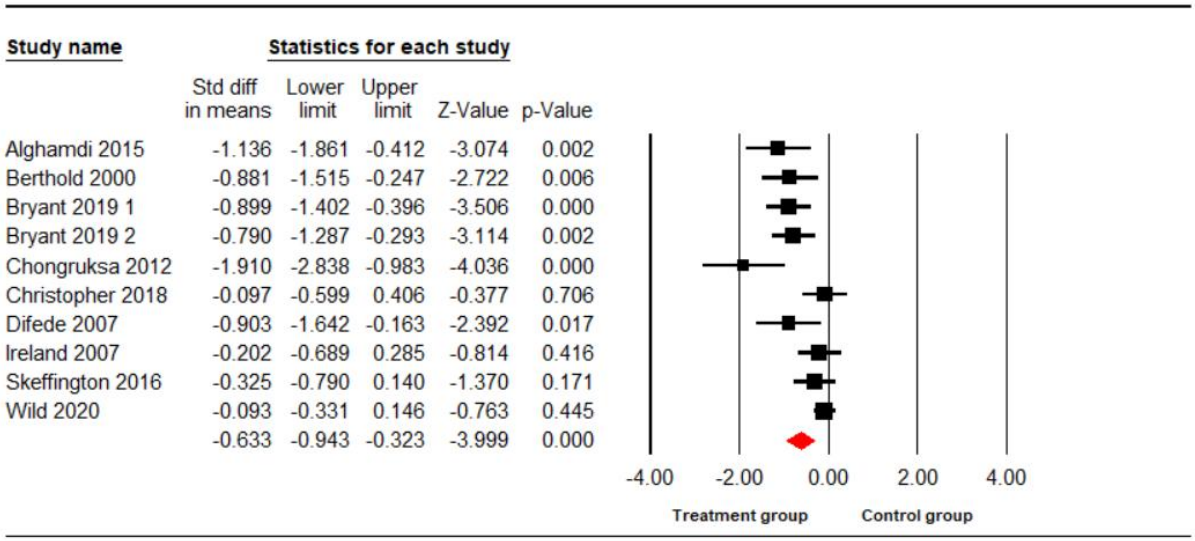


Figure 2.3 Forest plot for the effect of interventions on depression symptoms.

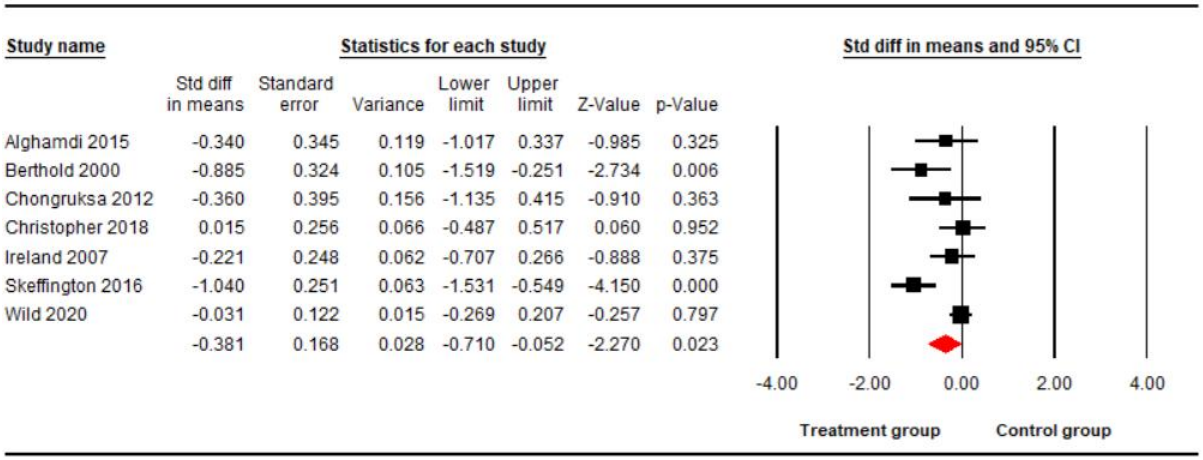


Figure 2.5 Forest plot for the effect of interventions on anxiety symptoms.

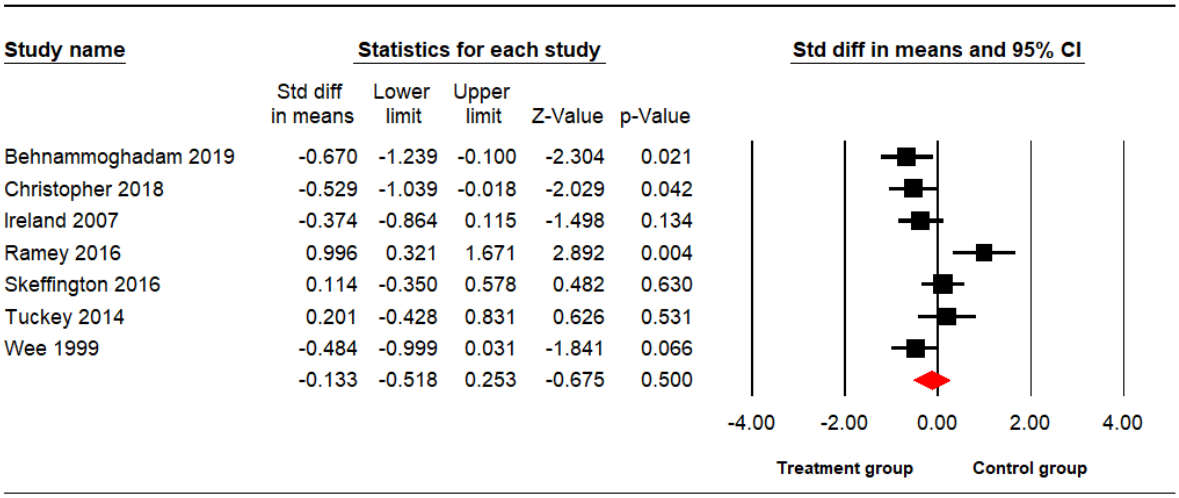


Figure 2.6 Forest plot for the effect of interventions on stress symptoms.

2.4.5 Comparing between interventions

Cognitive behaviour therapy was the most common intervention (4 comparisons from 3 studies) used to treat PTSD, anxiety and depression. However, across the 7 anxiety studies, CBT was used only once, therefore, we were only able to compare CBT with all other interventions for the outcomes of PTSD and depression. We also compared interventions delivered by clinicians (8 studies) against those delivered by non-clinicians (6 studies) and the interventions that were delivered individually (8 studies) versus those provided in a group format (6 studies) for PTSD and depression outcomes. In terms of comparing between CBT and other interventions, the results showed that there were statistically significant differences between the standardised difference in means between the CBT and all other interventions for PTSD symptoms, such that CBT was more effective (Q= 5.74; *p*= 0.01), but this was not found for depression, where the difference was non-significant (Q= 3.44; *p*= 0.06). Interventions delivered by clinicians were associated with greater reductions in PTSD compared with those delivered by non-clinicians (Q= 7.59; *p*< 0.001), but interventions delivered individually were not associated with greater reductions in PTSD than group interventions (Q= 3.47; *p*= 0.06). For depression, however, there were no differences between clinician compared with non-clinician delivery (Q= 1.78; *p*= 0.18), or individual compared with group format (Q= 2.46; *p*= 0.11). See Table 2.2.

Table 2.2 Comparing between three categories of interventions: CBT versus other interventions; clinician versus non-clinician providers; and individual versus group interventions for PTSD and depression

Outcome	Comparator	N	SDM (p)	CIs	I^2	Q (p) within studies	Q (df) and p between the groups
PTSD	CBT	4	-1.38 (0.00)	-0.81; -1.95	70.58	10.19 (0.017)	5.742 (1) 0.01
	Other interventions	6	-0.50 (0.02)	-0.06; -0,94	82.02	27.81 (0.00)	
Depression	CBT	4	-0.90 (0.00)	-1.19; -0.60	0.000	0.59 (0.89)	3.449 (1) 0.06
	Other interventions	6	-0.41 (0.01)	-0.68; -0.18	72.62	18.26(0.00)	
PTSD	Clinician	7	-1.20 (0.00)	-1.48; -0.97	82.93	35.15 (0.00)	7.59 (1) <0.001
	Non-clinician	3	-0.20 (0.00)	-0.45; 0.06	0.000	0.61(0.73)	

Depression	Clinician	6	-0.77 (0.00)	-0.97; -0.50	24.70	6.64 (0.25)	1.78 (1) 0.18
	Non-clinician	4	-0.39 (0.06)	-0.40; -0.01	78.96	14.26 (0.00)	
PTSD	Individual	6	-1.23 (0.00)	-1.07; -0.65	90.88	54.83 (0.00)	3.47 (1) 0.06
	Group	4	-0.33 (0.37)	-0.39; -0.00	53.98	6.51 (0.089)	
Depression	Individual	6	-0.77 (0.00)	-0.97; -0.50	24.70	6.64 (0.25)	1.78 (1) 0.18
	Group	4	-0.39 (0.06)	-0.40; -0.01	78.96	14.26 (0.00)	

Note * **N** = number of comparison; **SDM** = Standard difference of means; **CI** = Confidence interval; $\mathbf{I^2}$ = score of heterogeneity; **Q** = Cochrane's Q test statistic testing for between group differences

2.4.6 Tests of moderation

The moderate risk (n = 6) and high risk (n = 1) studies were combined and compared with the low risk (n = 8) studies using meta-regression. The results showed that there was moderating effect of risk of bias for only PTSD (Q = 5.05; p = 0.01), such that studies with low risk was reported to have higher SDMs. However, there were no moderating effect of risk of bias for anxiety (Q = 0.59; p = 0.44), depression (Q = 1.13; p = 0.28) and stress outcomes (Q = 0.41; p = 0.81) (see Table 3). We also examined the moderating effects of gender, mean age, sample size, number of intervention sessions and the total number of minutes of interventions (Table 2.3). For PTSD, only the number of sessions was found to be significant moderators (Q = 14.6; p = 0.001), such that studies with more intervention sessions was found to have larger SDMs. For anxiety, only mean age was found to be a significant moderator on the outcome, such that studies with a higher mean age had a larger SDM (Q = 10.4; p = 0.01). For depression and stress there were no significant moderators. Moreover, gender was found to have no moderating effects on any of the outcomes.

Table 2.3 Meta-regression analyses relating to sample size, risk of bias, number of sessions, and the total length of intervention minutes

Outcome	Moderator	B	R^2	SE	Q	P
PTSD	Risk of bias	1.07	0.50	0.45	5.50	0.019
	Gender	0.00	0.39	0.00	3.40	0.065
	Mean age	-0.07	0.00	0.05	2.30	0.129
	Sample size	0.00	0.08	0.00	2.05	0.152
	Number of sessions	-0.18	0.73	0.04	14.6	0.001
	Total length of intervention minutes	-0.00	0.00	0.00	2.62	0.105
Anxiety	Risk of bias	0.14	0.00	0.00	0.59	0.441
	Gender	0.00	0.00	0.83	0.00	0.973
	Mean age	0.06	0.93	0.02	10.4	0.001
	Sample size	0.00	0.00	0.00	1.95	0.328
	Number of sessions	-0.01	0.00	0.04	0.05	0.820
	Total length of intervention minutes	0.00	0.14	0.00	0.89	0.345
Depression	Risk of bias	0.29	0.18	0.27	1.13	0.287
	Gender	0.00	0.18	0.02	1.64	0.200
	Mean age	0.01	0.00	0.02	0.17	0.682
	Sample size	0.00	0.25	0.00	1.99	0.158
	Number of sessions	-0.03	0.19	0.03	0.97	0.325
	Total length of intervention minutes	-0.00	0.00	0.00	0.06	0.813
Stress	Risk of bias	-0.48	0.00	0.61	0.41	0.813
	Gender	-0.01	0.00	0.22	0.41	0.521
	Mean age	-0.01	0.00	0.06	0.04	0.844
	Sample size	-0.02	0.04	0.02	1.79	0.181
	Number of sessions	-0.12	0.56	0.05	4.29	0.038
	Total length of intervention minutes	0.00	0.00	0.00	0.01	0.912

Note **B** = Beta result; **R^2** = Proportion of total between- study variance; **SE** = Standard Error; **Q** = Cochrane's Q test statistic testing for between group differences; **P** = significance level

2.4.7 Publication bias

Egger's regression coefficients found evidence of publication bias in the depression studies (intercept = -3.97; 95% CI, -6.07 – -1.34; p = 0.003), but not for PTSD (intercept= -4.57; 95% CI, -8.64 – -0.51; p = -0.031), anxiety (intercept= -2.29; 95% CI, -6.14 – 1.55; p = 0.186) and stress (intercept = 7.36; 95% CI, -6.58 – 21.3; p = 0.230) (See e-figures 2,3,4, and 5). However, a funnel plot suggested that missing studies were reported in only the right side of the mean for PTSD and depression (4 studies in each), and 3 studies in anxiety. Duval and Tweedie's trim and fill analysis (Duval and Tweedie, 2000) found a small reduction in the SMD after missing studies

for PTSD, depression, and anxiety were imputed (SDM= -0.21; CI, -0.34 – -0,08), (SDM= -0.26; 95% CI, -0.39 – -0.12), and (SDM= -0.07; CI, -0.22 – 0.07) respectively.

2.4.8 Sensitivity analyses

When we used a leave-one-out method (Higgins and Green, 2008), the finding for PTSD and depression varied (between -0.73 and -0.98 for PTSD and between -0.53 and -0.71 for depression), but both outcomes remained significant, suggesting the findings were not driven by any single study. In contrast, there were two studies in the anxiety analysis (Carlier, Voerman, and Gersons, 2000b; Skeffington et al., 2016) which when removed in isolation led the analyses to become statistically non-significant (SDM= -0.304; p= 0.07) and (SDM= -0.214; p= 0.08) respectively. Similarly, there was one study in the stress analysis (Ramey et al., 2016) which when removed led to a statistically significant finding (SDM= -0.133; p= 0.50).

2.5 Discussion

The main aim of the present systematic review and meta-analysis was to synthesise the evidence about the effectiveness of psychological interventions for improving mental health symptoms in first responders. A secondary aim was to compare the effectiveness of different types and format of interventions (CBT versus other interventions, clinician delivered versus non- clinician delivered interventions and individual-based versus group-based interventions) included in the review. The results of the meta-analysis showed that psychological interventions were associated with a significant reduction in PTSD symptoms, depression, and anxiety, but not stress. Moreover, the analyses also revealed that CBT was significantly more effective than other interventions for PTSD only, not for depression symptoms. Interventions delivered by clinicians were found to be more effective for PTSD outcomes but not for depression outcomes.

Subgroup analyses also indicated that interventions were more effective in studies that were classified as having low risk of bias contrasted to the moderate-to-high risk of bias studies. The number of sessions was found to be a significant moderator for interventions for PTSD, such that more sessions were associated with greater intervention effectiveness. For anxiety outcomes, only the mean age was found to be a significant moderator of intervention effectiveness, such that higher mean age was associated with greater intervention effectiveness. For depression and stress, no significant moderating variables were found.

The main finding of this meta-analytic review is in line with most previous systematic reviews (Alden et al., 2020; Anderson et al., 2020; Bahji et al., 2021; Haugen et al.,

2012; Smith and Roberts, 2003; Winders et al., 2020) that psychological interventions are effective for reducing PTSD symptoms among first responders. Haugen et al (Haugen et al., 2012c) found large significant treatment effects in two RCT designs included in their review. While Alden et al (Alden et al., 2020) found, in 8 RCTs out of 21 studies included in their review, that psychological interventions were effective for treating PTSD symptoms in first responders. Similarly, with additional other types of first responders (e.g., military soldiers, nurses, and doctors), Winders et al. (Winders et al., 2020) found 13 out of 18 studies that evaluated psychological treatments reported a positive impact of interventions for preventing and treating psychiatric symptoms in first responders. Furthermore, in a review of studies in frontline healthcare and public safety personnel, Anderson et al (Anderson et al., 2020) found some mixed evidence for the effectiveness of organizational peer-support and crisis-focused psychological interventions. Similarly, Bahji et al (Bahji et al., 2021), in their meta-analysis found that the psychological interventions reduced PTSD symptoms in public safety personnel. Therefore, taken together, there is clear evidence from multiple reviews that psychological interventions are effective in helping to treat PTSD in first responders.

However, the current review differs in three important ways from previous reviews. Firstly, this is the first meta-analysis to compare between the effectiveness of intervention types. Secondly, unlike other reviews (Anderson et al., 2020; Haugen et al., 2012; Smith and Roberts, 2003) our meta-analysis focused on only two types of study designs (RCTs and controlled before-after designs), thereby, providing more robust evidence of the effectiveness of psychological interventions in this context. Thirdly, our review covered a range of mental health outcomes in addition to PTSD.

There are several similarities between our current review and a recently published meta-analysis (Bahji et al., 2021). However, our present review differs to this in four key ways:(1) Bahji et al (Bahji et al., 2021) focused on ‘public safety personnel’, while this meta-analysis investigated first responders using the ‘traditional’ definition; (2) Bahji’s et al (Bahji et al., 2021) limited their searches from 2008 to 2019 only, while we searched from database inception to 2021, which explains the larger number of studies in this meta-analysis (15 studies compared with 8 studies); (3) Unlike (Bahji et al., 2021), the present meta-analysis specifically compared between three different elements of interventions: CBT versus other interventions, clinicians versus non-clinicians, and individual versus group interventions; (4) Unlike (Bahji et al., 2021), in the current meta-analysis, we also examined the effects of 6 moderators which were gender, mean age, sample size, number of intervention sessions and the total number of minutes of interventions by using meta-regression analysis.

Moreover, our review was the first to test whether there was any difference in the effectiveness of different types of psychological interventions in first responders, and the first to report that CBT was significantly more effective than other types of psychological interventions for reducing PTSD only, not for depression. This pattern of findings is consistent with findings from previous meta-analyses in non-first responder groups. Researchers have reported that several psychological treatments are effective for reducing PTSD in adults (Benish, Imel, and Wampold, 2008; Cusack et al., 2016). For example, two meta-analytical reviews (Bisson et al., 2007b; Watts et al., 2013) reported that trauma-focused cognitive therapy (TF-CBT) and EMDR were the most effective psychological therapies for treating PTSD in adults. While another recent meta-analysis (Althobaiti et al., 2020) found that interpersonal psychotherapy was effective for reducing PTSD. However, most included studies in those meta-analyses were adults who were 'first victims' (e.g., sexual assaults, car accidents, refugees) who often suffered from one traumatic event. This is different to first responders who can be regarded as 'second victims', and who experience multiple traumas in their daily work. Therefore, the nature of their work makes them different from other populations due to the barriers they suffered such as stigma, fear of losing their job, and not knowing where to get help (Haugen, McCrillis, Smid, and Nijdam, 2017). In terms of intervention providers, our findings suggested interventions delivered by clinicians were significantly more effective for reducing PTSD symptoms compared to those delivered by non-clinicians. However, there were no significant differences between individual versus group delivery or clinician versus non-clinician delivery for depression outcomes. Therefore, taken together, the current findings suggest, where possible, that future interventions targeting PTSD symptoms ought to be delivered by clinicians.

We also found that the number of sessions was a significant moderator in PTSD studies such that psychological interventions were more effective in studies with a higher number of treatment sessions. This finding is consistent with some previous reviews (Hansen, Lambert, and Forman, 2002; Lambert and Alhassoon, 2015). Another significant moderator in studies with anxiety outcomes was age such that psychological interventions were more effective in studies with participants with higher mean age. This finding may be explained by the fact that symptoms of anxiety have been found to be higher in older compared to younger (Wolitzky-Taylor, Castriotta, Lenze, Stanley, and Craske, 2010)

Surprisingly, the current systematic review and meta-analysis only identified a small number of RCT studies conducted in paramedics. It is now established that the prevalence of PTSD is higher in paramedics than other first responders. Therefore, there is an urgent need to investigate the effectiveness of psychological interventions

in paramedics group. Yet, we only found 2 studies in paramedics compared with 6 in police officers, 3 in firefighters, and 4 in mixed disaster workers. Also, there is a clear lack of studies that treat burnout among the same population, and this is concerning as the burnout prevalence rate among paramedics has been found to range from 16% to 56% (Reardon, Abrahams, Thyer, and Simpson, 2020). Therefore, our findings suggest that future research ought to conduct further, higher quality RCTs aimed at improving mental health outcomes in paramedics (as well as other first responders).

All included studies were from 8 different countries, and most of them (11 out of 15 studies) were from the USA, Australia, England, and the Netherlands, which limits the generalisability of the current findings. Differences between developing and developed countries in terms of prevalence of PTSD have been reported(Yatham, S., Sivathasan, S., Yoon, R., da Silva, T. L., and Ravindran, 2018). Also, there are differences in the type and availability of psychological interventions for PTSD and mental health generally in developed and developing countries. Therefore, it would be useful for future research to conduct comparative studies between these countries in terms of the types and frequency of traumatic events first responders are exposed to, the available supports they use and the effectiveness of any existing interventions.

2.5.1 Strengths and limitations

The present systematic review and meta-analysis has a number of strengths. The design of this systematic review followed the guidance of the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2008) and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Moher, Liberati, Tetzlaff, and Altman, 2009). The protocol of our review was registered on the PROSPERO database. Also, the current meta-analysis focused on RCT designs, which have numerous benefits such as providing strong empirical evidence of treatment's efficacy, randomisation of the participants to the intervention and control groups and minimisation of the allocation bias (Levin, 2007).

Nevertheless, we are aware that there are also some limitations that ought to be acknowledged. The findings are based on a relatively small number of studies and there was a high level of heterogeneity between studies due to differences in the included studies, such as being conducted in developed versus developing countries, outcome measures, sample sizes, and length of interventions. Even though the review attempted to account for the heterogeneity by conducting subgroup analysis and meta-regressions, the variance was still high. Another limitation was that many of the studies have relatively short follow-up periods, therefore, we are unable to draw firm conclusions about the longer-term effects of interventions (Johnson and Panagioti, 2018). This is important here because first responders are vulnerable to multiple

traumas in their work, even after receiving treatment, and follow-up assessment helps determine whether treatment gains can be maintained when exposed to various traumatic events (Alden et al., 2020). Furthermore, overall, there were seven studies that were scored as having moderate or high risk of bias total scores, and six studies with no intervention in control groups that may lead to the blinding bias Therefore, future studies should ensure that participants are blinded, include active control conditions, make sure that missing data are addressed adequately and allocation concealment is utilised to help reduce risk of bias. Also, the publication bias analyses identified that there were some missing studies in the right-hand side of the funnel plots for PTSD, depression, and anxiety. A number of factors may account for this potential publication bias. For example, it might be because of the relatively small number of studies conducted in this area and/or that many of the studies are underpowered due to small sample sizes leading to small effects. Therefore, researchers should endeavour to prioritise these types of studies and ensure that future studies are adequately powered, preregistered and embrace open research practices as much as possible (Bosnjak et al., 2021; O'Connor, 2021). It might also be fruitful for future research to explore the effectiveness of psychological interventions on other stress-related physiological outcomes (e.g., cortisol levels; cf.,(O'Connor, Branley-Bell, et al., 2020), as well as psychological outcomes. We also recognise that we did not include other types of first responders (e.g., emergency room personnel; military personnel) and recommend that further research reviews whether interventions may help reduce mental health problems in these groups.

2.6 Conclusion

The current systematic review and meta-analysis found that psychological interventions were effective for reducing PTSD, depression, and anxiety symptoms but not for stress in first responders. Further research is needed to estimate the effectiveness of other types of interventions with high quality RCT designs over longer periods of follow-up.

Chapter 3 How do potentially traumatic work events impact Saudi and UK ambulance personnel and how do they cope? A qualitative, cross-cultural investigation

This paper has been published in BMC emergency medicine (27th June 2022): Alshahrani, K.M., Johnson, J., Hill, L., Alghunaim, T.A., Sattar, R. and O'Connor, D.B., 2022. A qualitative, cross-cultural investigation into the impact of potentially traumatic work events on Saudi and UK ambulance personnel and how they cope. BMC emergency medicine.

3.1 Introduction

Post-traumatic stress disorder (PTSD) is common in first responders who attend accidents and emergencies (Haugen et al., 2012; Kleim and Westphal, 2011). PTSD includes 20 symptoms which are organized under four clusters of: (1) intrusion; (2) avoidance; (3) negative cognitions and mood; and(4) arousal (American Psychiatric Association, 2013b). Ambulance workers are one group of first responders, including Paramedics and Emergency Medical Technicians (EMTs), that are the most vulnerable to PTSD (Berger et al., 2012; Skogstad, Skorstad, Lie, Conradi, Heir, & Weisæth, 2013). According to reports, PTSD prevalence in these groups ranges from 5.4% in Germany to 94% in Iran (Eiche, Birkholz, Jobst, Gall, and Prottengeier, 2019; Iranmanesh, Tirgari, and Bardsiri, 2013). In the last decade, two systematic reviews have estimated that PTSD prevalence in paramedics overall ranges between 11% to 14.6% (Berger et al., 2012:Petrie et al., 2018).

However, in their systematic review and meta-regression of PTSD prevalence among first responders internationally, Berger et al (Berger et al., 2012) found significant differences in PTSD prevalence between different countries. In particular, they identified that ambulance personnel in developed countries tended to have a lower prevalence of PTSD than those in developing countries. For instance, PTSD rates in ambulance personnel in Italy were 15.7%, in Germany, they were 5.4%, and in the United Kingdom (UK), they were 9.2%. These figures stood in contrast to rates of 89% in Palestinian ambulance personnel, 94% in Iranian ambulance personnel, and 53.6% in Pakistani ambulance personnel(Abu-El-Noor et al., 2016; Carmassi et al., 2018; Eiche et al., 2019; Iranmanesh et al., 2013; Kerai et al., 2017; Petrie et al., 2018; Stevelink et al., 2020).

In Saudi Arabia, estimates of PTSD prevalence in ambulance workers have varied, but rates are higher than those reported in European countries. One study in Riyadh city estimated PTSD among paramedics from King Khalid Abdul Aziz Medical City

(KAMC) and found that 30% of paramedics were experiencing PTSD (Alaqeel, Aljerian, AlNahdi, and Almaini, 2019). Another study among Saudi Red Crescent Authority ambulance personnel who worked in Makkah city found 41% of paramedics were affected by PTSD (Khan et al., 2020). The different results between these two studies are probably due to the differences in organizations, locations, and type of self-report questionnaires used. However, despite these elevated rates of PTSD in Saudi ambulance workers, only a small number of studies have investigated trauma experiences in this population. This is concerning, as figures suggest that Saudi ambulance personnel attend to a particularly high number of traumatic events such as car crashes, and as such may be at high risk for developing PTSD (Almoshaogeh et al., 2021; Yohannes and Minale, 2015).

Reasons for the variations observed between countries could include differences in ambulance service organizational structures, differences in questionnaire scale type used, variations in diagnostic classifications, trauma status, sample size and methods (Iranmanesh et al., 2013; Petrie et al., 2018). Additionally, lack of public awareness about ambulance work and the provision of work requirements in developing countries could be one of the reasons for the higher prevalence of PTSD in ambulance personnel from these countries (Ward, Lombard, and Gwebushe, 2006).

In addition to these organizational factors, it has also been found that psychological and social factors, such as the type of psychological interventions which are available and social support, are associated with PTSD levels in ambulance workers. In their systematic review to estimate the prevalence rate of the mental health problems among ambulance personnel, (Petrie et al., 2018) found that these factors and others can explain the international variation in PTSD prevalence rates in ambulance personnel. However, they have not been adequately studied, and more studies are needed before firm conclusions can be made.

Studies which compare the mental health of paramedics between developed and developing countries are rare. We have identified only one cross-cultural study which has been conducted in paramedics between Saudi Arabia with another country (which was Australia) (W. A. A. Khan et al., 2020). This study found that rates of depression and PTSD were higher among Saudi paramedics than Australian paramedics (Almoshaogeh et al., 2021). The authors suggested that the higher prevalence of depression and PTSD among Saudi paramedics may be explained by their long working hours, lack of organizational support, lack of appropriate training, and conflict with patients' family members.

Moreover, there is a lack of qualitative cross-cultural research in ambulance personnel. Qualitative studies which have been conducted in single country samples

are informative, suggesting that critical events involving the death of a patient can cause ambulance personnel significant distress but are not events they feel able to disclose and discuss with others (Avraham, Goldblatt, and Yafe, 2014; Halpern, Gurevich, Schwartz, and Brazeau, 2009; Loef et al., 2021). A qualitative approach could be particularly beneficial for helping to explain the variation in rates between ambulance personnel in different countries. However, to date, there is no qualitative study that has explored ambulance workers' mental health between developed and developing countries. Therefore, the current qualitative study aimed to address this gap by conducting a cross-cultural, qualitative investigation exploring the experiences of potentially traumatic work events in Saudi ambulance personnel and UK ambulance personnel. PTSD rates are relatively high amongst Saudi ambulance personnel and lower for UK ambulance personnel. The overall aim of the current study was to investigate the lived experience of potentially traumatic work events between Saudi and UK ambulance personnel. The specific aims were to investigate: 1) the impact of potentially traumatic events on Saudi and UK ambulance personnel; 2) how they coped with these events, and; 3) the types of support they preferred.

3.2 Methods

3.2.1 Participants and Recruitment

We recruited ambulance personnel, including paramedics and Emergency Medical Technicians (EMTs), who had experienced one or more traumatic events during their work and who had worked for the ambulance service for a year or more. While we confirmed participants' length of service at the beginning of the interviews, we did not ask participants to confirm that they had experienced a traumatic event. Instead, this was the focus of the interview schedule and so was referred to throughout the interviews. No definition of trauma was provided, so participants each brought their own personal definition of this concept.

We recruited participants from two countries – the UK and Saudi Arabia - who were currently practicing in a clinical capacity via a purposive sampling method. We excluded participants who reported working less than a year because during this period they are usually under practical supervision. Also, volunteers were excluded from participating due to their short working hours. Paramedics responded to study advertisements which were distributed via emailing their organizations and posted on social media (Twitter and Facebook). In the UK, emails were circulated to practice educators by L.H., who has experience as a course director and professional lead of Paramedic Science. In Saudi Arabia, the email was sent to the manager of the Saudi Red Crescent Authority (SRCA) in the Eastern area of Riyadh city.

3.2.2 Design

This study used qualitative interviews to explore the views and experiences of paramedics in two countries (the UK and Saudi Arabia). A semi-structured interview schedule was developed, containing open-ended questions. The interview schedule consisted of three sections: (1) types of potentially traumatic events experienced at work; (2) strategies used by paramedics to cope with potentially traumatic events and the effectiveness of those strategies; and (3) the type of support or interventions paramedics would like in the future in order to cope with critical situations.

The target sample size of this cross-cultural study was between 12 to 30 paramedics informed by previous studies. According to (Guest, Bunce, and Johnson, 2006), who conducted 60 interviews in two West African countries, they found that saturation occurred during the first 12 interviews. Similarly, (Hagaman and Wutich, 2017) interviewed 132 participants in four cultures, and they found that 16 or fewer interviews were sufficient to determine common themes among locations with relatively homogenous communities. Moreover, fewer participants are needed when the sample has more information relevant to the actual study, which is known as ''information power'' (Malterud, Siersma, and Guassora, 2016).

Semi-structured interviews were chosen to encourage an open dialogue with paramedics when collecting information related to the study aims. All interviews were conducted by K.A. The interview guide was piloted during two mock interviews with J.J. and a professional Saudi paramedic who has more than 15 years of experience. The purpose of the pilot interviews was to improve the fluency of the topic guide. For Saudi participants, all interviews were conducted in Arabic, and transcripts were translated from Arabic to English by the first author (K.A.), an Arabic native speaker from Saudi Arabia. The translation was reviewed by another Arabic native speaker from Saudi Arabia (T.A.).

3.2.3 Data Collection

All interviews were conducted by phone between February to July 2019. Phone interviews were chosen to allow access to paramedics in different locations in each country. Talking about trauma can be a sensitive topic for paramedics who may not want to disclose it in order to avoid stigma and feelings of vulnerability. Nevertheless, interviews provide participants with a chance to talk about their profound personal experiences freely (Hiller and DiLuzio, 2004; Knox and Burkard, 2009). Therefore, the telephone interviews were considered an appropriate format as they provided a greater level of privacy. Participants have previously reported feeling more secure in phone interviews due to being in their own location rather than restricted by a specific interview location (24,25). Participants also report benefit from reduced social

pressures and greater anonymity when interviews are conducted via phone (Knox and Burkard, 2009; Novick, 2008). Interviews were translated (for Saudi participants) and transcribed. All translations were conducted by the first author (K.A.) and checked by a second bilingual author for accuracy (T.A.).

3.2.4 Data Analysis

The data was analysed using thematic analysis (Braun and Clarke, 2006). This analytical approach is distinguished from other methods by high flexibility in sorting and describing the data set and identifying the most stable themes (Braun and Clarke, 2006; Braun, Clarke, and Terry, 2014). Thematic analysis involves six steps. First is familiarisation with the data by reading and rereading all transcripts and writing down the initial ideas. The second step involves generating initial codes; we systematically coded several parts of data, and then the data was organized based on these codes. This phase was completed by K.A. with all transcripts. 30% of transcripts were double-checked and coded by R.S. and J.J. The third step involves developing the themes; in this step, codes were compiled and further developed into higher themes. During the fourth step, potential themes were reviewed during a meeting between the researchers. In this stage, members of the research team (K.A., J.J., R.S.) met and verified that the themes matched to the level of the extracted data. The fifth stage involved defining and naming themes. During this phase, the researchers (K.A. and R.S.) agreed to all final codes by discussion. The final stage involved producing the report to provide a compelling narrative about data based on the analysis. All codes and themes were unpacked, sorted, and organized by using Microsoft Excel 2016 (Bree and Gallagher, 2016).

3.2.5 Ethics

The study was approved by the School of Psychology Ethics Committee at the University of Leeds, UK (ref no: PSC-578; date approved: January 14, 2019), and the research was performed in accordance with the Declaration of Helsinki for research involving human participants. Paramedics were provided with information sheets and asked to return the consent forms with their signatures to the main author's email. Participants were informed that they had a right to decide whether or not to take part in the study. Also, they were informed that they had a right to withdraw from the study, including the withdrawal of their data for up to one month after the interview and the right to refuse to answer questions in the interview. Due to the sensitivity of the research topic, paramedics were contacted after the study to ensure that they did not suffer from any psychological harm as a result of their participation. No negative impacts were reported by paramedics as a result of participation in the study.

3.3 Results

A total of 21 potential participants responded to the advertisement, and 16 ambulance workers completed interviews. Three potential participants were ineligible because they were working as volunteers and they had been practicing for under a year. Two withdrew before the interview dates, resulting in a final sample of 16 interviews for analysis: 8 participants from each country. Interviews lasted between 17 min and 82 min with a mean of 37mins and 53 secs. All interviews were audio-recorded. The UK participants included three males and five females with a mean age 31.62 (SD= 7.53) from four regions (Northeast, Northwest, Southwest, East of England). While in Saudi Arabia, all interviewees were males with mean age of 32.12 (SD= 3.40) from three regions (southern, western, and the middle region). The range of service years for all participants was between 1.8 to 17.3 years, with a mean 8.05 (SD= 5.20). Thematic analysis identified four main themes and no subthemes (see Table 1).

3.3.1. Thematic analysis of the interviews

3.3.1.1 Theme one: Some events are inherently more stressful than others

In both countries, certain types of events were described by paramedics as being inherently more stressful to deal with. For example, paramedics in both cultures had similar reactions to events involving exposure to severe physical injuries. All paramedics found traumatic accidents such as car accidents stressful, but these were more frequently reported by Saudi paramedics:

> *Traffic accidents are the worst effect on me, and the first accident I faced in my work was the worst one. We received a call about the incident with multiple physical injuries; when arrived at the incident location, we found all victims had died (nine female teachers and the tenth was the driver), except a little girl about three years is only one still alive. (SA par 10)*

All paramedics found incidents involving assault, violence, and family conflict stressful. They also found incidents and accidents within family particularly stressful, but all these types of events were more frequently encountered by UK paramedics:

> *My worst one would be that a friend of my children got killed on a farm. So, it was a three-year-old, but it was a child that I knew basically got run over by a tractor, which his dad was driving. (UK par 68)*

Paramedics described events that presented a threat to their own physical safety as particularly stressful, although these were more frequently discussed by UK paramedics than Saudi paramedics:

> *I would have said probably the most stressful event would be assaults, like being assaulted on the job. Yeah, probably the worst one was when my crewmate and I got attacked by a man with a baseball bat, and my colleague ended up with a fractured skull. (UK par 02)*

Events involving vulnerable victims such as children and elderly people were reported as stressful by paramedics in both cultures. However, Saudi participants also discussed being impacted by events including female victims. This appeared to be due to religious and cultural reasons, and the fact that all Saudi paramedics are men:

> *The hardest event is car accidents, especially if the victims and injured are female because it is difficult to deal with them. They suffer from severe injuries, and at the same time, they do not want to be touched by a strange man. Therefore, I am compassionate with them. (SA par 11)*

3.3.1.2 Theme two: The pressure of organizational and interpersonal stressors

Cross-cultural, organizational, and interpersonal pressures were significant factors influencing how well paramedics coped with the traumatic events they faced when working. The nature and severity of these pressures varied between the UK and Saudi participants. Three main pressures were recorded. The first of these was pressures from colleagues/co-workers including bullying, unqualified partners, and partners who lacked experience. These stressors were more frequently reported by UK paramedics:

> *I find criticism by colleagues stressful because there is widespread bullying within ambulance services. (UK par 16)*

However, Saudi paramedics also reported experiencing stress related to their co-workers, such as irritable paramedics.

> *I worry when I work with some colleagues who quickly get angry, especially when the relatives of the patients get out of control because my focus then is divided on doing my [own] work, observing [my colleague's] work, and trying to calm [my colleague] down. (SA par 88)*

The second was pressure from the organization including ambulance personnel feeling afraid of losing their job due to strict organizational rules. This pressure was described by paramedics in both cultures but was more commonly discussed by Saudi participants who suffered from unfair organizational policies (e.g., the paramedics are responsible for any damage of ambulance cars). This included not insuring ambulances against traffic accidents and asking the paramedics to repair them since they were responsible for the ambulances. In addition, it also included not providing a financial incentive which is usually added to their salaries as standard (known as a vulnerability-to infection allowance):

> *The main management of the authority, unfortunately, does not appreciate the work of the paramedic through some policies that apply to the paramedic. (SA par 44)*

The third factor was pressure from society. Paramedics from both countries described feeling underappreciated by the public and sometimes experiencing members of the public interfering or interrupting them when they were undertaking their duties in public places. This pressure was more frequently described by Saudi participants, who felt that an increase in appreciation would have reduced the impact of stressors on them:

> *If most people appreciate and realize the difficulty of the ambulance work and not everyone can do this work, this in itself is a great support that gives me greater motivation to do the best. (SA par 11)*

However, this pressure was also referred to by some UK paramedics, who said working while there are many people around the incident site put them under heightened pressure because all eyes are on the paramedic:

> *Working in front of a load of people there puts you under a lot of pressure, which means that you feel like you're unable to make as many mistakes compared to a different job, it's more stressful, and I think it's more emotional stress. (UK par 02)*

3.3.1.3 Theme three: Convergence and divergence in cross-cultural coping strategies

This theme captured the similarities and differences in coping strategies used by paramedics in both cultures. Some strategies were used by paramedics in both countries. One of these included sports activities, which were used as a distraction technique in both cultures, with different types of sports preferred by paramedics in each culture. Participants from the UK used running and swimming, while Saudi participants walked and went to the gym after finishing their shifts:

> *I run quite a lot, so I find that's a really good way of sorting things out in my head. (UK par 02)*

> *I find walking is the best way to adapt quickly to work issues. So, when I think of a stressful accident after work, I go home and change my clothes and walk alone on the Corniche (a place overlooking the sea) for a long-distance sometimes up to 4 km. (SA par 88)*

In both countries, paramedics also described consciously separating their professional and personal lives in order to avoid work stressors when they are not working:

> *When I'm out of work, I close my phone and do not share my activities with colleagues to forget all the daily events I've been through. (SA par 05)*
>
> *I'm not talking about the more serious jobs I go to my wife because I don't want to bother her. I don't want her to deal with the things I have to deal with. So, I try not to bring business events with me into my home or even into my private life. (UK par 17)*

Participants in both countries reported learning how to cope with these events from their relatives and friends who worked in similar jobs as first responders by observing or seeking advice:

> *I knew this strategy from a colleague who works as a police officer, and as you know, he faces similar cases as I do; and told me that if you have any emotional problems at work, do not keep that issue inside your mind, you must speak other about what you faced because you will psychologically suffer. (SA par 11)*
>
> *I don't talk to my mum about it particularly. I might talk to my dad. My dad was a police officer, and he so has had some similar experiences. He gave me some good advice to do the best, but he retired nearly 20 years ago. So, his memories are from a long time ago, really. (UK par 17)*

In contrast, there were three coping strategies that were only reported by paramedics in one of the two cultures. One of these was prayer and spirituality, which was only described by Saudi paramedics. Saudi Arabia is a Muslim country, and as such, all participants who described using this coping strategy referred to praying and reading the Quran (the Muslim holy book) and found this a helpful and beneficial practice:

> *Yes, the praying, I use it a lot because when I am uncomfortable with something wrong in my work, or in my life, I prepare to pray. I feel a wonderful comfort even if nothing happens in the subject matter that made me worry because I believe that my God will guide me to solve this problem. (SA par 14)*

The remaining two strategies could be regarded as potentially risky or harmful and were only reported by UK paramedics. The first of these was gambling; the participants who used this described finding it to be a useful distraction that helped them to take their minds off the stressful work events they had experienced:

> *I typically find gambling is a good distraction technique as well, so I would sometimes go and just put bets on and just relax for an hour or so. (UK par 14)*

UK paramedics also described drinking alcohol to help them cope with potentially traumatic work events. The participants who reported using this strategy said they did this in conjunction with socialising with family or friends and found that it provided a useful distraction from unhelpful thoughts of work:

> *I find after the event; I will typically try and distract myself. So, there's been times where I've asked family members to go for drinks out just to distract myself and get into a different environment other than the normal home that I come back to. (UK par 14)*

3.3.1.4 Theme four: Preferring formal and confidential support

This theme describes the preferences which paramedics had for the kind of support they would prefer to be offered after being involved in a potentially traumatic work event. Interestingly, preferences were similar in paramedics from both countries, with both groups expressing a preference for formal support and interventions provided by their organization over informal, ad-hoc support from colleagues or supervisors. Paramedics felt that the offer of formal support would increase their sense of being valued by their organizations:

> *An official intervention makes me feel that I am under the attention of my organization as a staff member in all psychological and educational aspects. This thing gives me more motivation in my work performance and in everything around me. (SA par 05)*

> *I like both, but the formal support was what actually really helped me, in the end, is having a stranger who knows what they're doing, in terms of psychological support, to help. That's what sort of actually really sorted me out in the end. (UK par 68)*

Individual support was also preferred by both UK and Saudi participants rather than group support in order to protect their privacy:

> *Probably individual treatment I would choose. I think I just feel more comfortable speaking to just one person who would probably understand. I think I'd be more open with him rather than in a big group. I think I'd struggle to speak freely in a big group. (UK par 56)*

> *It is better individually because I will be more comfortable talking in case it is talking to someone else and protecting the privacy. (SA par 27)*

Table 3.1 Themes, descriptions, and example quotes

Themes	Descriptions	Example
Some events are inherently more stressful than others	There were certain features of events which led them to be more stressful: 1) Events that were unexpected or involving obvious injuries. Both cultures have similar reactions to the same types of trauma. However, the type of event discussed varied between cultures: • In Saudi, participants seemed most impacted by car accidents. • In the UK, participants frequently discussed the emotional impact of events including assault, violence, and family disputes. 2) Events threatening the safety of ambulance personnel. Both cultures discussed their concern over safety threats, but UK paramedics emphasized this theme more.. 3) Events involving vulnerable persons, such as children or the elderly. There were negative emotional impacts on child victims in both countries. Participants in Saudi Arabia reported being affected by events involving female victims.	• Traffic accidents are the worst effect on me, and the first accident I faced in my work was the worst one. (SA par 10) • I would say the family events are more stressful, and my worst one would be that a friend of my children got killed on a farm. (UK par 68) • The worst one was when my crewmate and I got attacked by a man with a baseball bat and my crewmate ended up with a fractured skull. (UK par 02) • The hardest event is car accidents, especially if the victims and injured from the female because it is difficult to deal with them. They suffer from severe injuries, and at the same time, they do not want to be touch by a strange man. Therefore, I am compassioning with them. (SA par 11)
The pressure of organisational and interpersonal stressors	Organisational and interpersonal stress was described as significant, but the nature and type of this stress varied depending on the culture. Sources of stress in this theme included:	

	• Pressure from colleagues such as bullying or unqualified/inexperienced partners. • Organizational pressure such as lack of interest feeling to lose a job or being unprotected from infectious diseases. • Society pressure such as unappreciation and disrespect from people.	• I find criticism by colleagues stressful because there is widespread bullying within ambulance services. (UK par 16) • The main management of the authority unfortunately, does not appreciate the work of the paramedic through some policies that apply to the paramedic. (SA par 44)
Convergence and divergence in cross-cultural coping strategies	This theme described the similarities and differences in coping strategies and distraction techniques across cultures. *(1) Cross-culturally used techniques:* • Sport activities • Separation of the work from private life • Learning from other first responders *(2) Culturally variable coping techniques:*	• I run quite a lot, so I find that's a really good way of sorting things out in my head. (UK par 02) • when I'm out of work, I close my phone and do not share my activities with colleagues to forget all the daily events I've been through. (SA par 05) • I knew this strategy from a colleague who works police officer, and as you know, he faces similar cases as I do, and told me that if you have any emotional problems at work do not keep that issue inside your mind, you must speak other about what you faced because you will psychologically suffer. (SA par 11) • Yes, the praying, I use it a lot because when I uncomfortable with something wrong in my work, nor in my life, I prepare to pray. I feel a

	• Prayer and believing • Gambling • Drinking alcohol with family members or friends	wonderful comfort even if nothing happens in the subject matter that made me worry because I believe that my God, will guide me to solve this problem. (SA par 14) • I typically find gambling is a good distraction technique as well, so I would sometimes go and just put bets on and just relax for an hour or so. (UK par 14) • I find after the event I will typically try and distract myself. So, there's been times where I've asked family members to go for drinks out just to distract myself, get into a different environment other than the normal home that I come back to. (UK par 14)
Preferring formal and confidential supports	This theme explains the preferences of paramedics and how to provide them from their point of view. • Formal support or intervention • Individual support	• The official intervention feels me that I am under the attention of Red Crescent as a staff member in all psychological and educational aspects. This thing gives me more motivation in my work performance and in everything around me. (SA par 05) • Probably individual treatment I would choose. I think I just feel more comfortable speaking to just one person who would probably understand. I think I'd be more open with him rather than in a big group. I think I'd struggle to speak freely in a big group. (UK par 56)

3.4 Discussion

The main aim of this study was to investigate the lived experience of potentially traumatic work events between Saudi and UK ambulance personnel, in order to identify: (1) the impact of these potentially traumatic events on ambulance personnel in both cultures; (2) to understand how they cope with these events; and (3) to gain insight into which type of support they preferred. The results found four key themes, which suggested that: (1) some work events were inherently more stressful than others, particularly those involving physical injuries, vulnerable victims or threats to the paramedics themselves; (2) organizational and interpersonal stressors such as incivility compounded the impact of stressful events; (3) there was both convergence and divergence in coping strategies between cultures, with physical activity used by paramedics in both countries, but spiritual coping only used by Saudi paramedics; and (4) all paramedics preferred formal and confidential support to informal support or group interventions.

Previous studies have used qualitative methods to examine how ambulance personnel experience and cope with potentially traumatic work events, but none has compared experiences of these events between ambulance personnel in two different cultures. We found that paramedics reacted to comparable types of events in similar ways, but exposure to event types varied. Saudi ambulance workers frequently discussed the stress they experienced in response to car accidents, and this may be because car accidents are common in Saudi Arabia, with one person dying and four injured every hour in a car accident (Al Turki, 2014). According to the World Health Organization WHO (2018), Saudi Arabia reported the highest rate of road deaths and injuries of all high-income countries in 2016, with an estimated 28.8 per 100,000 population, compared with a world average of 17.7 per 100,000 population. Moreover, traffic accidents were the most common cases that were treated by Saudi paramedics based on the report of the Saudi Red Crescent Authority in 2019 (‘Open Data - Saudi Red Crescent Authority, 2019.). In contrast, UK ambulance personnel instead recounted potentially traumatic work events involving victims of assault, violence, and family disputes. This is consistent with a study by(D. A. Alexander and Klein, 2001), which investigated the prevalence of psychopathology among the UK personnel workers and its relationship to their exposure to critical incidents. The study found that the most stressful and disturbing incidents for ambulance personnel were those involving child victims, known victims to the ambulance crew, and severe injuries. Both the UK and Saudi participants also described concerns about events that threatened their safety. These concerns emerged more strongly among ambulance workers from the UK and were consistent with the results of two previous systemic reviews (Murray et al., 2020;

Pourshaikhian, Gorji, Aryankhesal, Khorasani-Zavareh, and Barati, 2016) that found an increasing prevalence of violence against EMTs and injuries at work between them.

However, it is possible that these types of events are less frequent for Saudi paramedics due to strict penalties imposed by the Saudi Ministry of Health against attacking and assaulting all health practitioners, including the ambulance personnel. These legal penalties may lead to ten years in prison or paying one million Saudi riyals (approximately £200,000) (MOH, 2019). Furthermore, the ambulance personnel in both cultures were negatively impacted by events with vulnerable victims, which is consistent with previous studies (D. a Alexander and Klein, 2001; Bennett et al., 2005; Boland et al., 2018; Loef et al., 2021; Regehr, Goldberg, and Hughes, 2002; Van der Ploeg and Kleber, 2003). These findings expand previous knowledge by showing that similar types of events have comparable impacts on paramedics cross-culturally; however, exposure to different event types varies.

The findings of the current study also showed that there are some cross-cultural differences in the sources of organizational and personal stress among ambulance personnel. In the UK, the ambulance workers were more impacted by pressures from their colleagues (e.g., bullying, blaming, or not performing their duties properly), which is in line with some previous studies. For example, bullying of NHS ambulance workers in the UK has been found to be the result of strict administrative practices, increased work demands, and reduced resources (e.g., (Kline and Lewis, 2019; Manolchev and Lewis, 2021). While Saudi ambulance workers suffer less from such pressures, they reported feeling more organizational pressures than their peers in the UK. This finding contrasts with the results from a recent qualitative study (Alanazy, Fraser, and Wark, 2021) which found that Saudi EMSs were satisfied and happy with their job in SRCA. This inconsistency may be due to the fact that the study by (Alanazy et al., 2021) focused on the comparison between the aspects of financial and administrative support among EMSs in rural and urban areas, while our study is concerned with psychological support, in particular, creating and developing intervention and prevention programs based on coping strategies and support preferences used by paramedics.

In terms of coping strategies, the current study found that Saudi ambulance personnel used religious coping mechanisms, whereas UK ambulance workers did not. This finding is consistent with a previous study by (Koenig et al., 2014) which found that prayer and reading the Holy Qur'an are popular strategies to treat and diminish stressful events among Saudi people. The UK ambulance personnel used different distractions such as gambling and drinking with others. It is also consistent with studies showing that gambling and drinking have been used as distractions among

paramedics and EMSs in the UK to cope with stressful events (Buchanan, McMullin, Baxley, and Weinstock, 2020; Dixon et al., 2019; Halpern, Gurevich, Schwartz, and Brazeau, 2009a; Mildenhall, 2012; Regehr, Goldberg, Glancy, and Knott, 2002; Regehr and Millar, 2007). However, these findings extend existing research by showing that culture is a powerful influencing factor in leading people to identify appropriate methods to cope with stressful events. They also suggest that psychological interventions designed to support ambulance workers will need to be sensitive to these cultural variations. Future interventions might consider incorporating spirituality for Saudi paramedics while recognizing and discussing the potential for risky or harmful coping strategies in UK paramedics.

Ambulance personnel in both cultures preferred formal organizational support, despite most Saudi participants indicating that they did not receive any formal organizational support (Alshahrani, Johnson, and O'Connor, 2022). This aligns with previous research, which has suggested that after critical events, most paramedics and EMTs prefer workplace interventions (Donnelly, Bradford, Davis, Hedges, and Klingel, 2016; Halpern, Maunder, Schwartz, and Gurevich, 2011, 2014), and this may help them to cope with the emotional impact and regain control and confidence in their performance (Orner, 2003). Also, the current study found that the ambulance personnel in both countries preferred individual interventions rather than group interventions (such as(Prudenzi et al., 2021). This adds to the existing knowledge base on intervention preferences for ambulance personnel and may be due to a desire to protect their privacy and avoid stigma from others (Haugen, McCrillis, Smid, and Nijdam, 2017).

3.4.1 Strength and Limitations

This is the first qualitative study to compare the experiences of ambulance personnel in these two different cultures: the UK as a developed country and Saudi Arabia as a developing country. It benefited from the use of a diverse research team including both Saudi and UK natives and multiple bilingual speakers to check data and translations. However, findings may be limited due to self-selection bias as all interviewees volunteered to participate and may not reflect the majority of ambulance workers in each country. It is also limited by the use of semi-structured interviews to collect data. It is possible that an observational approach may have enriched the findings, but due to the nature of ambulance work, this was not possible in either country.

3.5 Conclusion

Few studies have investigated the potentially traumatic events among ambulance personnel and how they cope during and after these events have occurred. This cross-cultural study compared ambulance personnel in the UK and Saudi Arabia to try to

understand paramedics' views about which traumatic incidents they experience, coping strategies they use, and the support they prefer to deal with these events. There were differences in the nature of traumatic events and ways of coping between the two cultures, but paramedics in both cultures had agreement about their preferences for individual and formal support. The results of this study may be used by organizations that are responsible for ambulance services to improve the performance of ambulance workers by monitoring potential traumatic events and designing prevention and intervention programs to deal with them.

Chapter 4
Coping strategies and social support are associated with post-traumatic stress disorder symptoms in Saudi Paramedics

This study has been published in the International Journal of Emergency Services (19th April 2022): Alshahrani, K.M, Johnson, J., and O'Connor, D. B. (2022). Coping strategies and social support are associated with post-traumatic stress disorder symptoms in Saudi paramedics. International Journal of Emergency Services.

4.1 Introduction

Ambulance personnel include paramedics, emergency medical technicians (EMTs) and other workers who deliver on-site emergency medical care and transport prior to hospital admissions during accident and emergency medical situations (Petrie et al., 2018). These professionals are exposed to high levels of occupational trauma (Berger et al., 2012; Skogstad, Skorstad, Lie, Conradi, Heir, & Weisaeth, 2013; Sterud et al., 2006b) and report more psychological problems than other health workers (Sterud et al., 2006b). Post-Traumatic Stress Disorder (PTSD) is common among ambulance personnel and its prevalence is higher than that found in the general population (American Psychiatric Association, 2013; Berger et al., 2012; Petrie et al., 2018).

The general prevalence of PTSD in ambulance personnel has been calculated to be 11% internationally (Petrie et al., 2018) but the estimates vary significantly between countries. Reports range from 5.6% in Brazil to as high as 94% in Iran (Berger et al., 2007; Iranmanesh et al., 2013). These differences between countries might be affected by various factors including differences in organizational structures, trauma status, scale types, sample size and methods (Iranmanesh et al., 2013; Petrie et al., 2018). However, it is also possible that the reported prevalence rates could be affected by the coping strategies ambulance personnel use and the social support available to them.

Lazarus and Folkman (1984), defined coping as a key part in their transactional theory of stress as constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person. They classified two types of appraisals that precede the coping process: a primary appraisal in which the individual usually identifies the potential harm, loss, threat, or challenge posed by the stressor, and a secondary appraisal in which the individual is able to evaluate coping options and available resources. These appraisals provide the basis for coping that leads to two categories of coping a problem-focused strategies that aim to treat a stressful problem, and

emotion focused strategies that focus on reducing the emotional consequences of the problem(Abraham *et al.*, 2016; Herman and Tetrick, 2009). Another category was add by Carver, Scheier and Weintraub (1989), that concentrated on avoidance strategies by ignoring problems and emotional reactions.. However, some studies (e.g., Aldwin and Revenson, 1987; Bonanno, 2004; Yagil, Ben-Zur and Tamir, 2011) suggested that using coping focused on emotion and avoidance may increase the risk of developing PTSD, while the problem focused strategies can reduced the risk of PTSD (Gil & Weinberg, 2015). There are some factors that may affect the choice of coping strategies such as personality individual differences, stability of coping disposition, and nature of situational coping (Abraham et al ,2016). Studies into coping strategies have identified that ambulance personnel use a variety of coping strategies to help them deal with the daily traumatic events they face. These coping strategies can be used before, during, and after emergency cases (Duschek et al., 2020; Mildenhall, 2012). For example, research suggests that they use emotional suppression during stressful events to be more focused on their duties, and after events they might employ storytelling or avoidance as coping strategies (Mildenhall, 2012). Strategies can be divided into those which are *active*, such as seeking emotional support from others or doing some sports activities, and those which are *passive*, such as self-blaming or using drugs. Overall, research evidence suggests that active coping strategies are effective in reducing PTSD symptoms and stress in ambulance personnel (Avraham et al., 2014), but passive coping methods increase the risk of PTSD (Brooks & Brooks, 2021; Kerai et al., 2017).

On the social level, Cohen (2004), defined social support as ‘ the social resources that persons perceive to be available or that are actually provided to them by non-professionals in the context of both formal support groups and informal helping relationship’ (p.4). Several classifications of social supports in previous literature, according to Uchino, Cacioppo and Kiecolt-Glaser(1996), have compared between structural and functional types of supports. Structural support refers to a person’s organization of relationships or the number of rules that he participates in social situations, whereas functional approaches focus on the purpose of such social connections, and this measure of support have include perceived support which refers to the belief that support will be available if needed, and received support that reflects the actual receipt of support within the specified time frame (Thoits, 1995; Uchino, 2008; Uchino et al., 2018; Wills & Shinar, 2000). There are four levels of social supports are linked with coping: social support as a coping strategy, as a coping resource, as a result of coping, and as a entirely integrated part of a coping process in a social system (Schreurs & de Ridder, 1997). Various studies have indicated that the social support from family, friends and their organisations both during and after

working hours can impact ambulance personnel's' levels of stress, resilience and PTSD symptoms (Oliveira, Teixeira, Neto, & Maia, 2020; Skogstad et al., 2013; Stevelink et al., 2020; Van der Ploeg & Kleber, 2003; Donnelly, Bradford, Davis, Hedges, & Klingel, 2016; Regehr, Hemsworth, & Hill, 2001; Shakespeare-Finch, Rees, & Armstrong, 2015). Moreover, social support can be useful to implement interventions that help paramedics recover from traumatic events and other stress (E. A. Donnelly et al., 2016).

In Saudi Arabia, ambulance services are provided by paramedics who work for the Saudi Red Crescent Authority (SRCA), which is an independent government authority responsible for providing Emergency Medical Services (EMS) in the Kingdom of Saudi Arabia (Alanazi, 2012; AlEnazi & AlEnzie, 2018). As first responders, Saudi paramedics face many administrative, psychological, and cultural problems that affect their psychological health such as the lack of organisational support, conflict with patients' relatives, and the level of awareness of EMS by the community (AlShammari et al., 2017; W. A. A. Khan et al., 2020), and there is a need to know how they could be better supported in their work. Several factors that may make Saudi paramedics more stressed than their peers in other countries: 1) Saudi Arabia has the highest road death and injury rates of all high-income countries (*WHO | Programme Budget Web Portal*, 2018), and all these accidents are dealt by ambulance. 2) During the Hajj season (Pilgrimage in Islam), Saudi ambulance works to provide health services to more than two million pilgrims from all countries in two cities Mecca and Medina (Al Mutairi et al., 2016). 3) Saudi paramedics work longer hours (48 hours per week) compared to their peers in other countries such as Australia (W. A. A. Khan et al., 2020). According to Alaqeel et al. (2019), the prevalence rate of PTSD in Saudi ambulance personnel is 26.9%. However, this is the only study that has examined the prevalence of PTSD symptoms in Saudi paramedics and it has three notable limitations. First, the sample size was small (74 participants) and second, all of the participants were recruited from one Red Crescent authority (King Abdulaziz Medical City) that is located in only one region of Saudi Arabia (Riyadh region). As such, it is hard to generalize the results to the paramedics in other regions of Saudi Arabia. Third, the study used the PTSD Checklist-Civilian version (PCL-C) which measures reactions to only one specific traumatic event. Paramedics face multiple and various potentially traumatic events in their work and it is important to investigate their possible reactions to this work more broadly (Brewin, 2005; Haugen et al., 2012b). Furthermore, there has been no research that has investigated, within the same study, which sources of social support and coping strategies are associated with lower levels of PTSD in Saudi paramedics. Knowing this could be useful to understand which support and coping

strategies may help to mitigate PTSD in paramedics and help inform future psychological interventions (Kirby et al., 2011; Ogińska-Bulik & Kobylarczyk, 2015).

4.2 Aims

In order to address these gaps in knowledge, the current study aimed to investigate the levels of PTSD symptoms in Saudi paramedics and whether social support and coping strategies were associated with lower levels of PTSD. There were three main objectives of this study:

1. To estimate the prevalence rate of PTSD symptoms among Saudi paramedics

2. To investigate which types of coping strategies were associated with PTSD symptoms among Saudi paramedics.

3. To explore which sources of social support were associated with PTSD symptoms among Saudi paramedics.

4.3 Methods

4.3.1 Participants

Qualified paramedics working for Saudi Red Crescent Authority (SRCA) in Saudi Arabia were recruited to the study between 01/09/2019 and 01/12/2019. Recruitment literature was sent out to paramedics working in the five main regions of Saudi Arabia (Middle, Eastern, Western, Northern, and Southern regions), which included 13 different administrative areas of Saudi Arabia (Al-madenah, Albaha, Aljouf, Aseer, Eastern area, Hail, Jazan, Makkah, Najran, Northern boards, Qaseem, Riyadh, and Tabouk). Participants were able to complete the questionnaire online or to use a paper version. Two ways of recruiting participants were used: 1. Twitter and snowball sampling. 2. Web link via email and text message to paramedics distributed via their organisation. The paper copies were sent by post (50 copies) to paramedics working in rural cities, where Wi-Fi availability is poor. 15 out of 50 paper copies were returned. 202 participants responded online. This study was approved by the Research Ethics Committee of University's School of Psychology (PSC-731, 29/07/2019).

4.3.2 Measures

Three scales were used: the Screen of Post-traumatic Stress Disorders (SPTSS)**,** the Brief COPE Scale (BC), and the Social Support scale. All scales were translated (and back translated) from English to Arabic by Jaber (2012) and shown to be reliable and valid.

4.3.2.1 Screen of Post-traumatic Stress Disorders (SPTSS)

The Screen of Post-traumatic Stress Disorders Scale (SPTSS) (Carlson, 2001) has 17 items measuring three subscales: 1) 'Re-experience' measures memories of the traumatic events or recurrent dreams related to it, 2) 'Hyper-arousal' measures aggressive irritability, or sleep and concentration disturbances, and 3) 'Avoidance' measures the avoidance of painful thoughts, feelings, or external reminders of traumatic events (Segal, 2010). These subscales are based on the PTSD symptomatology provided by the Diagnostic and Statistical Manual of Mental Disorders (4^{th} edition) and item responses are scored on a 5-point scale for last 2 weeks [(0 = Not all), (1 = 1 or 2 times), (2 = Almost every day), (3 = About once every day), and (4 = More than once every day)]. To classify as having probable full or partial PTSD, participants must report: 1) 1 or more of the 5 re-experiencing items, 2) 3 or more of the 7 avoidance items, and 3) 2 or more of the 5 arousal items. This scale was because, 1) it was validated with first responders in 2 Arabic countries (Alghamdi et al., 2017; Snell et al., 2016), 2) it is a valid measure for capturing multiple traumas such as those experienced by paramedics in their work (Brewin, 2005; Hamblen, 2004).

4.3.2.2 Brief Coping Scale

Coping was measured using the Arabic version of the Brief Coping Scale (Carver, 1997) which was translated by Jaber (2012). It contains 20 items evaluating 2 factors. The first is 'active coping' (13 items) which includes items on religion, planning, and positive reframing, such as "I have been taking action to try to make the situation better". The second is 'passive coping' (6 items) and measures behavioural disengagement, substance abuse, and self-blame. Example items include "I have been giving up the attempt to cope". Cronbach's alphas for the active and passive coping scales were 0.86 and 0.75, respectively. The Brief Coping Scale has four response options for each item; 1= "I haven't been doing this at all", 2= "I have been doing this a little bit", 3= "I have been doing this a medium amount", and 4= "I have been doing this a lot". Possible scores on each subscale range from 13 - 53 for the active, and 6 - 24 for the passive subscale.

4.3.2.3 Social Support Scale

Social support was measured using Jaber's Social Support Scale (Jaber, 2012). The scale consists of 13 items that cover three sources of social support (13 items in each): family, friends, and government or non-government organization support (in the current study, the government or non-government organization was changed to Saudi Red Crescent Authority). The Cronbach's alphas for family and friends, and SRCA subscales were 0.96, and 0.95, respectively. An example item is "I feel that the support

that I have received was helpful". The Social Support Scale has four response options for each item (0 = not at all, 1 = little, 2 = moderate, 3 = very much).

4.4 Statistical analyses

The data were analysed using the IBM SPSS (version 26). Descriptive statistics were calculated for each of the study variables (see Table 2). Pearson's Product Moment correlations were used to explore the associations between PTSD symptoms and the social support and coping subscales. Hierarchical linear regression was used to investigate the predictors of PTSD with three different steps of variables. Step 1 included age and years of service, step 2 included family, friends, and organisational supports, and step 3 included active and passive coping. Finally, binary logistic regression was used to examine the association between PTSD as a dichotomous outcome (full and partial PTSD = 1 and non-PTSD = 0) and coping (active and passive) and social support (family, friends and organisation support).

4.5 Results

The study sample included 217 paramedics from 5 regions of Saudi Arabia. Ages ranged between 21 and 55 years (mean = 33.58; SD = 5.91). Years of service were between 1 and 36 years (mean = 8.58; SD = 6.40) and most participants were married (N =174). (See Table 4.1).

Table 4.1. Demographic characteristics of participants (N=217)

Demographical variables	Number	Percentage
Areas		
Middle	39	18%
Western	63	29%
Eastern	29	13.4%
Northern	30	13.8%
Southern	56	25.8%
Total	217	100%
Marital status		
Married	174	80.2%
Unmarried	43	19.8%
	Mean	**SD**
Age	33.58	5.91
Years of service	8.58	6.40

4.5.1 Descriptive statistics

100 participants (46%) reported experiencing at least one PTSD symptom; 38 (17.5%) met criteria for full PTSD, and 62 (28.57%) met criteria for partial PTSD criteria. 117 (53.9%) participants did not meet the criteria of PTSD. Mean scores and standard deviations for PTSD symptoms, coping strategies and social support are presented in Table 4.2.

Table 4.2 The means and standard deviations for PTSD, coping strategies and social support subscales

Measures	Subscales	Mean	SD
PTSD	Avoidance	9.47	6.06
	Arousal	6.74	4.65
	Re-experience	5.52	4.49
	Total	21.7	13.41
Brief Coping	Active	34.30	8.15
	Passive	12.02	3.83
Social support	Family and Friends	67.25	20.17
	Red crescent	19.43	8.96

4.5.2 Preliminary correlational analyses

Associations between all variables were analysed using Pearson Product Moment correlations. There was a significant positive relationship between PTSD and passive coping ($r = 0.55$, $p = .001$), while family and friends support had significant negative correlations with PTSD ($r = -0.17$, $p = .010$). Age, marital status and years of service were unrelated to any of the psychological variables (Table 4.3).

Table 4.3 Zero order correlations between PTSD and other variables

	1	2	3	4	5	6	7	8
1- All PTSD	--	.09	.55**	-.17*	-.07	-.08	.11	-.01
2- Active coping		--	.23**	.45**	.41**	-.05	-.02	-.04
3-Passive coping			--	-.02	.06	-.08	.03	-.09
4- Family and friends support				--	.42**	-.01	-.00	-.04
5- SRCA support					--	.03	-.04	-.08
6- Age						--	.29**	.01
7- Marital Status							--	-.03
8- Years of service								--

*Note: *p < 0.05; **p < 0.01*

4.5.3 Factors associated with PTSD symptoms using hierarchical regression analysis

The hierarchical regression analysis was conducted in three steps. At step 1, age and years of service were not significantly associated with PTSD symptoms. Similarly, at step 2, none of the social support variables were significantly associated with PTSD symptoms. However, at step 3, passive coping was found to significantly explain 32% of the variance in the total PTSD symptom score ($\Delta R^2 = 0.31$, $p < 0.001$; see Table 4.4).

Table 4.4 The hierarchical regression analysis examining variables associated with PTSD

		β step 1	*β step 2*	*β step 3*	*ΔR^2* for step	Sig
Step 1	Age	-0.12	-0.12	-0.06	0.01	0.12
	Marital status	-0.14	-0.14	0.11		
	Years of service	-0.00	-0.01	0.03		
Step 2	Family and Friends support		-0.18	-0.17*	0.03	0.03
	Red crescent support		-0.00	-0.06		
Step 3	Active coping			0.08	0.33	<0.001
	Passive coping			0.52**		

*Note: *p < 0.05; **p < 0.01*

4.5.4 Predictors of PTSD caseness versus non-PTSD caseness using logistic regression

To estimate the relationship between PTSD and other variables, we coded PTSD into two categories (full and partial PTSD =1, and non-PTSD = 0) and conducted binary logistic regression. As shown in Table 5, only passive coping was significantly associated with PTSD, indicating that the odds of being in the PTSD caseness group increase 1.23 times for each unit increase in passive coping.

Table 4.5 The binary logistic regression to examine predictors of PTSD caseness versus non-PTSD caseness

Independent Variables	B	SE	Wald	df	Sig.	Exp(B)
Active Coping	.02	.02	1.44	1	.23	1.02
Passive Coping	.20	.04	22.26	1	<.001	1.23
Family and friends S	-.01	.00	2.81	1	.09	.98

Red crescent Support	-.02	.02	1.16	1	.28	.97

Note*:* B= Beta; SE= Standard Error; Wald= Wald chi-square test; EXP(B)= Exponentiation of Beta

4.6 Discussion

Nearly half of paramedics sampled reported PTSD symptoms, nearly one in five fully met the PTSD criteria and one of three were classed as having partial PTSD. Higher levels of passive coping and lower levels of family and friends support were associated with higher levels of PTSD symptoms. Furthermore, a greater tendency to endorse passive coping items was still associated with higher levels of PTSD symptoms when other relevant variables were controlled for and was associated with a significantly greater risk of PTSD caseness.

As this is only the second study to investigate PTSD symptoms in Saudi paramedics, these findings add important new knowledge to the literature. The rate of PTSD symptom prevalence was larger than that found in previous international systematic reviews. These reviews estimated prevalence at 12.4% (Perrin et al., 2007), 10% (Berger et al., 2012) and 11% (Petrie et al., 2018). This high rate of PTSD in Saudi paramedics may be due to their working conditions which include long hours of driving and lengthy work shifts. Furthermore, the shift pattern of Saudi paramedics involves the completion of two days of day shifts (12 hours), immediately followed by two days of night shifts (12 hours) which is followed by four days off before the pattern is repeated again (W. A. A. Khan et al., 2020). This shift pattern involves a high number of work hours combined with a high degree of sleep disruption, which is known to be a significant cause of work stress (W. A. A. Khan et al., 2020). Another reason may relate to the increasing number of fatal car accidents on Saudi roads (Al Mutairi et al., 2016; Alshamrani et al., 2020). It is estimated that 19 people are killed and 96 are injured each day in road traffic accidents, which is a relatively high rate given that the country's population size is 34 million (Mansuri, Al-Zalabani, Zalat, & Qabshawi, 2015 (The General Authority for Statistics, 2019). Road traffic accidents are a significant source of stress for first responders and may contribute to the high rates of PTSD in this group (Karlsson et al., 2020).

It is also notable that the rates of PTSD in the current study are higher than those found in a previous cross-sectional study in Saudi Arabia (Alaqeel et al., 2019). This difference may be due to three main factors. First, our study was larger (217 versus 74 participants) and may have managed to capture a greater range of participants who have been exposed to these high levels of stress. Second, we measured PTSD using the SPTSS measure, which differs to the measure used by Alaqeel et al. (2019). The SPTSS measure allows participants to report on their experiences of facing several

traumatic events every day in their work. The Post Traumatic Stress Disorders Checklist- Civilian version (PCL-C), used by Alaqqeel et al. (2019), only focuses on one specific trauma. Third, the nature of the organisation studied by our research differed to that included in Alaqeel et al (2019) study. All participants in the latter study were recruited from King Abdulaziz Medical City (KAMC) which only serves and is located in Riyadh city (the capital of Saudi Arabia) while the current study recruited paramedics from SRCA and serves all areas and cities in Saudi Arabia. Nevertheless, it is interesting to note that when compared with other middle east countries, the current study found lower prevalence rates. For example, PTSD prevalence has been found to be 89% in Palestinian ambulance personnel (Abu-El-Noor et al., 2016), and 94% in Iranian ambulance personnel (Iranmanesh et al., 2013). These high rates may be associated with other factors such as, relatively low-income status, natural disaster earthquakes in Iran, and insecure areas war zones in Palestine. In addition, these high rates of PTSD and stress more generally are likely to have negative implications for future physical health outcomes (O'Connor, Thayer & Vedhara, 2021) and may also impact on patient care (Hall et al., 2016).

In terms of coping, this is the first study that has investigated the coping strategies linked with PTSD symptoms in Saudi paramedics, and it found that greater use of passive coping strategies was associated with higher levels of PTSD symptoms. This finding is consistent with studies in other countries including Poland and Pakistan (Kerai et al., 2017; Rybojad et al., 2016). It is possible that paramedics choose to use passive coping strategies because they believe these will help them to be more comfortable and relax (Mildenhall, 2012). As use of these strategies is linked with higher rates of PTSD, it is likely that such coping strategies may ultimately be unhelpful and may need to be addressed through awareness-raising interventions and mental health support training (cf., Alanazi, 2012; Johnson et al., 2020; Khan et al., 2020; Prudenzi et al., 2021). Taken together, these findings are consistent with the broader coping literature that has shown that passive coping styles (e.g., Boland, Mink, Kamrud, Jeruzal, & Stevens, 2019) are maladaptive and should be discouraged in paramedic populations(Carver & Vargas, 2011)

Moreover, we found a significant, but modest association between higher rates of PTSD symptoms and lower levels of family and friends social support. This finding is in line with previous studies and may indicate that the ability to talk stressful events over with trusted significant others is beneficial (Avraham et al., 2014; E. A. Donnelly et al., 2016; Regehr et al., 2001). However, our regression results found that none of the social support subscales significantly predicted PTSD (when considered alongside coping, age and years of service). This means that sources of social support are insufficient and effective to help traumatised paramedics recover, and this is probably

due to people may be unaware of the nature and conditions of paramedic works and their frequent trauma exposure, and therefore, they are unable to help them. Other previous studies found no correlating between social support and PTSD (Al-Hadethe et al., 2014; Alghamdi et al., 2017; Andrews et al., 2003). This study extends existing knowledge by exploring and measuring the multiple trauma rate in Saudi ambulance personnel. Also, this study tries to highlight the coping methods used and their association to PTSD.

4.6.1 Strength and limitations

The current study has a number of strengths and weaknesses. For example, it included paramedics from all regions of Saudi Arabia and used validated scales that had only previously been used in Saudi culture with different type of first responders (firefighters). However, despite including paramedics in all Saudi regions, the numbers of participants were still relatively small, potentially limiting generalisability. The study also used self-selecting participants which may have led to some sampling bias. It also used self-report measures, which are prone to producing inflated estimates of mental health disorder prevalence (Dang et al., 2020). We therefore recommend that future research recruits a larger sample size of Saudi paramedics and uses stratified sampling to ensure representativeness.

4.6.2 Implications and future research

This research has important implications for knowing the prevalence level of PTSD among Saudi paramedics to provide appropriate psychological care before, during, and after potentially traumatic work events by SRCA. Also, the results of current study confirm the need to develop mental health services in SRCA in all Saudi regions instead of being in one region (Riyadh). Future research is needed to compare the PTSD symptoms, coping strategies used, and types of supports preferred among paramedics between two cultures, especially in developed and developing countries. Also, to estimate the relationship between the daily stress and coping strategies among paramedics based on the changing of their work shifts.

4.7 Conclusion

The current study found that nearly half of Saudi ambulance personnel were suffering from PTSD symptoms, and that there was an association between greater use of passive coping strategies and higher levels of PTSD symptoms and PTSD caseness. The current findings suggest that interventions to help reduce PTSD in Saudi paramedics should include strategies to reduce passive coping. Future research is

urgently required to help understand the psychological, social, and work-related factors that contribute to these high levels of PTSD.

Chapter 5 Exploring the relationships between encountering potentially traumatic work events, coping and symptoms of Post-Traumatic Stress Disorder (PTSD) in Saudi paramedics: A daily diary study

This study is under review and is presented in the same format required by the journal.

5.1 Introduction

Ambulance personnel include paramedics and emergency medical technicians (EMTs), and both groups suffer from high levels of trauma at work. They experience direct trauma from being physically abused by the people they are trying to help and indirect trauma by having to cope with traumatic injuries and the sudden deaths of many of their patients (Alden, Regambal, and Laposa, 2008; Berger et al., 2012; Petrie et al., 2018; Skogstad et al., 2013). As such, symptoms of Post-Traumatic Stress Disorder (PTSD) are common in this group (Berger et al., 2012).

According to reports, there is a large difference in PTSD prevalence among ambulance workers between countries, with rates below 25% in developed countries and above 40% in developing countries (Berger et al., 2012). For example, a study in Italy by Carmassi et al (2016), indicated that the prevalence rate in ambulance personnel was 15.7%, but a study using a similar methodology in Iran found 53.6% of ambulance personnel suffered from PTSD symptoms. Moreover, in one systematic review (Berger et al., 2012), aimed at estimating the prevalence rates of PTSD among rescue workers, it was found that countries in Asia had higher rates of PTSD than European countries.

In Saudi Arabia, paramedics face several administrative, psychological, and cultural problems that negatively affect their mental health, including a lack of organisational support, conflict with patients or their family members, and a lack of awareness of Emergency Medical Services (EMS) by the general public (AlShammari, Jennings, and Williams, 2017; Khan et al., 2020). However, few studies have been conducted in Saudi paramedics and it would be helpful to discover how they might be better supported. Furthermore, paramedics in Saudi Arabia may be more stressed than their peers in other countries due to a variety of factors: 1) Saudi Arabia has one of the highest rates of traffic fatalities and injuries among high-income countries, and all victims are transported by ambulance (*WHO | Programme Budget Web Portal*, 2018); 2) Saudi paramedics provide health services to over 2 million international pilgrims during the Hajj (Pilgrimage in Islam) in Mecca and Medina (Al Mutairi et al., 2016), which can be a stressful event for paramedics due to high rates of illness, injury and

death in pilgrims; 3) Compared to paramedics in other countries such as Australia, Saudi paramedics work longer hours (48 hours per week) (Khan et al., 2020). According to Alshahrani et al (2022), who surveyed 217 Saudi paramedics working in five regions in Saudi Arabia, 28.5% screened positive for partial PTSD and 17.5% screened positive for full PTSD, while 46% of participants experienced one or more PTSD symptoms.

The differences observed between countries may be attributed to several factors, such as differences in the organizational structures of ambulance services, variations in the specific PTSD questionnaires used, differences in diagnostic classifications, trauma status, and differences in sample size (Iranmanesh, Tirgari, and Bardsiri, 2013; Petrie et al., 2018). It is also possible that the variations in prevalence rates in previous studies have been influenced by variations in the coping strategies used by paramedics. According to Jonsson and Segesten (2004), the high prevalence of PTSD symptoms among ambulance personnel indicates that they find it difficult to cope with the potentially traumatic events they encounter during the course of their daily work.

The literature on coping strategies utilized by ambulance personnel is limited, but those studies which have been conducted in this group have generally drawn on Carver's model of coping (Carver, 1997) because it has been widely used to examine coping with both stressful events and traumatic stress (Jaber, 2012). The transactional model of stress and coping explained by Lazarus and Folkman (1984), conceptualises coping as constantly changing cognitive and behavioural processes that occur between an individual and their environment. It suggests that coping processes are influenced by two types of appraisals; primary appraisals where the person identifies any potential danger, and secondary appraisals in which the individual evaluates coping options and resources that are available. Broadly speaking, these primary and secondary appraisals can lead to two coping categories which are: 1) problem-focused strategies which aim to directly address external problems, and 2) emotion focused strategies which focus on reducing the emotional consequences of external problems (Abraham, Conner, Jones, and O'Connor, 2016; Herman and Tetrick, 2009). Carver et al. (1989) added avoidance strategies whereby both problems and emotional reactions are avoided and ignored as a third coping category. A person's choice of coping strategies may be affected by a variety of factors, such as the nature of the situation, personality differences, and the stability of coping dispositions (Abraham et al., 2016).

Research on coping strategies in ambulance personnel has indicated they use a number of strategies to cope with daily traumatic events they experience (Duschek, Bair, Haux, Garrido, and Janka, 2020; Mildenhall, 2012). For instance, some

paramedics suppress their emotions in stressful situations in order to remain focused on their duties, but after stressful incidents they may use storytelling or avoidance as coping strategies (Alshahrani et al., 2022; Mildenhall, 2012). However, previous studies in paramedics have focused on two types of coping; active coping and passive coping (e.g., Baek, 2011; Alshahrani, Johnson, and O'Connor, 2022; Duschek et al., 2020; Koh and Lee, 2012). Active coping is defined as behavioural and cognitive processes that focus on the problem at hand, while passive coping is defined as those that tend to lead to avoidance, withdrawal, or denial of the problem (Smith, Wethington, and Zhan, 1996, p. 213). In general, studies suggest that active coping, such as engaging in exercise, can reduce PTSD symptoms, whereas passive coping, such as self-blaming, can increase the risk of PTSD (Avraham, Goldblatt, and Yafe, 2014; Brooks and Brooks, 2021; Kerai et al., 2017).

Social support has also been identified as a factor which is consistently associated with coping strategies, and coping responses can play a role in subsequent support processes (DeLongis and Holtzman, 2005). However, instead of viewing social support as a single cohesive construct, it has been suggested that social support comprises of various categories. For example, Uchino, Cacioppo, and Kiecolt-Glaser (1996), proposed two types of support which are structural and functional support. Structural support describes how a person organizes his/her relationship to participate in social situations, while functional support is concerned with the aims of such social connections (Thoits, 1995; Uchino, 2008; Uchino et al., 2018; Wills and Shinar, 2000). Several studies have found that there is an association between the level of support perceived from family and friends and stress among paramedics (Alshahrani, Johnson, and O'Connor, 2022; Avraham et al., 2014; E. Donnelly, 2012; Regehr, Hemsworth, and Hill, 2001). For example, Alshahrani, Johnson and O'Connor (2022) found that support from family and friends was negatively associated with PTSD symptoms, indicating that individuals who had higher levels of support reported lower PTSD symptoms. Nevertheless, much of the existing research exploring the role of social support in paramedics has been cross-sectional. Less is known about how social support may influence daily processes in paramedics across time. Therefore, a key aim of the current research is to investigate the association between daily traumatic events and PTSD symptoms, coping strategies, and social support by using the end-of-shift, daily diary method among this population.

It has also been suggested that experiencing more frequent traumatic events can increase the risk of PTSD symptoms (Copeland, Keeler, Angold, and Costello, 2007; Geronazzo-Alman et al., 2017), but to date, no study has examined the daily associations between exposure to traumatic events, coping and PTSD symptoms among paramedics. In previous studies, two overarching observations can be made:

1) most studies have examined the cross-sectional associations between PTSD and other variables among paramedics (e.g, Alaqeel, Aljerian, AlNahdi, and Almaini, 2019; Berger et al., 2007b; Eiche et al., 2019; Kerai et al., 2017; Minnie, Goodman, and Wallis, 2015), and 2) the majority of previous studies have only measured PTSD at one point in time, rather than exploring possibly daily fluctuations (Halpern, Gurevich, Schwartz, and Brazeau, 2009b; Hsiao et al., 2019; Rybojad, Aftyka, Baran, and Rzońca, 2016). Moreover, some recent results from research into stress and PTSD symptoms among paramedics have emphasized the importance of using daily diary methods because: 1) the interaction of daily critical incidents, shift work, and long working hours with little recovery time between incidents are elements of increasing stress in paramedics, and 2) trauma exposure is repetitive and happens almost every day, potentially cumulative, and poses a threat to the safety, health, and well-being of paramedics and other first responders (Beaton & Murphy, 2013).

5.2 Research questions

The current study aimed to investigate the association between daily incidents and daily level of PTSD symptoms using an end-of-shift, daily diary approach. We were also interested in exploring the association between coping styles and subsequent daily PTSD symptoms, and the association between social support and daily PTSD symptoms.

Therefore, we addressed the following research questions:

1. Are daily incidents associated with daily PTSD symptoms?
2. Are coping styles associated with daily PTSD symptoms?

    2a. Is active coping style associated with daily PTSD symptoms?

    2b. Is passive coping style associated with daily PTSD symptoms?

    2c. Do active and passive coping styles moderate the association between daily incidents and daily PTSD symptoms?

3. Is social support associated with daily PTSD symptoms?

    3a. Is family and friends support associated with daily PTSD symptoms?

    3b. Is Saudi Red Crescent Authority SRCA support associated with daily PTSD symptoms?

    3c. Does social support moderate the association between daily incidents and daily PTSD symptoms?

5.3 Methods

5.3.1 Design

Participants completed an online baseline questionnaire and then online end-of-shift diaries (an interval-contingent approach) for 4 days (2-day shifts, and 2-night shifts). To help increase protocol adherence, participants were sent a text message reminder before and after each shift with a link to their online diary.

5.3.2 Ethical consideration

This study was approved by the University of Leeds, School of Psychology Ethics Committee (reference number PSYC-279, date: 20/07/2021). The participants were fully informed about the types of questions that would be involved in the study prior to submitting their consent. Also, they were informed of their right to withdraw at any time before, during, and after participating, up until the point of analysis (one month after study completion). They were also informed that any contact information they provided would be kept completely anonymous via the use of a unique participant code. Finally, they were provided with contact information for relevant support and helplines at the end of study in case they became distressed due to the potentially sensitive nature of the study.

5.3.3 Participants and procedure

Participants were Saudi ambulance personnel working in Saudi Red Crescent Authority SRCA, recruited via emails and text messages sent to participants distributed by their organization to complete diary surveys between 10/09/2021 and 01/02/2022. Participants logged on to secure website and read the information sheets and completed an electronic consent form. After that they read the instructions for the study and created their own username. Then, they completed baseline measures of PTSD (Screen of Post-traumatic Stress Disorders Scale SPTSS and PTSD Check-List 5 PCL-5), coping strategies (Brief Coping Scale), and social support. They then received daily text message reminders to log back into the secure website at the end of their shifts, for four working days (two days shifts, and two nights shifts) to complete measures of daily PTSD, coping strategies, and type of incidents.

5.3.4 Baseline measures

5.3.4.1 Screen of Post-traumatic Stress Disorders Scale (SPTSS) (Carlson, 2001)

This measure aims to reflect PTSD symptoms provided by the Diagnostic and Statistical Manual of Mental Disorders (DSM 4th edition). It includes 17 items divided into three subscales: 1) ‘Re-experience’ evaluates the traumatic events memories or

repeated dreams linked with trauma, 2) ‘Hyper-arousal’ measures aggressive behaviour, or concentration and sleep problems, and 3) ‘Avoidance’ measures avoidance of painful feelings, thoughts, or external reminders of trauma (Segal, 2010). The responses of the items are scored on a 5-point scale for the last two weeks [(0 = Not all), (1 = 1 or 2 times), (2 = Almost every day), (3 = About once every day), and (4 = More than once every day)]. To be classified as suffering from probable full or partial PTSD, respondents must report: 1) 1 or more of the 5 re-experiencing items, 2) 3 or more of the 7 avoidance items, and 3) 2 or more of the 5 arousal items. The scale was validated with first responders in two Arabic cultures (Alghamdi, Hunt, and Thomas, 2017; Snell, Etter, Carlson, and McCaslin, 2016). Also, it is an appropriate and valid measure for capturing multiple traumas such as those experienced by paramedics in their work (Brewin, 2005; Hamblen, 2004). The Cronbach’s alpha scores in the current study showed acceptable internal consistency, being 0.88, 0.65, 0.81, and 0.76 for the total scales, avoidance, arousal, and re-experience subscales, respectively.

5.3.4.2 PTSD Check-List-5 (PCL-5)

The PCL-5 is a self-report measure that assesses PTSD symptoms based on DSM-5 criteria (Blevins, Weathers, Davis, Witte, and Domino, 2015). The original scale contains 20 items with a total possible score ranging from 0-80. In this study, we used the abbreviated 8 item version of PCL-5 (Price, Szafranski, van Stolk-Cooke, and Gros, 2016). The items measured PTSD symptoms experienced over the last month on a 0-4 Likert scale (0 = Not at all, 4 = Extremely). Possible scores ranged from 0-32. We used the Arabic version of scale translated by Ibrahim and colleagues (2018). The Cronbach’s alpha in the current study was 0.80 for eight items.

5.3.4.3 Brief Coping Scale

Coping was assessed using the Arabic translation of the Brief Coping Scale (Carver, 1997). This was translated and developed for Arabic cultures by Jaber (2012). The scale includes 20 items measuring two factors. The first is ‘active coping’ (13 items) which contains religion, planning, and positive reframing items, such as ‘I've been trying to find comfort in my religion or spiritual beliefs’. The second factor is ‘passive coping’ (6 items) which covers behavioural disengagement, substance abuse, and self-blame. An example item is “I've been blaming myself for things that happened”. Cronbach’s alphas for the active and passive coping scales were 0.87 and 0.73, respectively. This scale has four responses for each item; 1= “I haven’t been doing this at all”, 2= “I have been doing this a little bit”, 3= “I have been doing this a medium amount”, and 4= “I have been doing this a lot”.

5.3.4.4 Social Support Scale

Social support was examined using Social Support Scale (Jaber, 2012). Three sources of social support are measured in the scale (13 items in each): family, friends, and government or non-government organizations (in this study, the non-government organization was replaced to Saudi Red Crescent Authority). The Cronbach's alphas for all items, family and friends, and SRCA subscales in the present study were 0.96, 0.95, and 0.97, respectively. An example item is 'I feel satisfied about the support that I have received'. The Social Support Scale has four response options for each item (0 = not at all, 1= little, 2= moderate, 3= very much). The cut-off point $\geq$10.

5.3.5 The daily shift measures

At the end of each shift, participants were asked to complete questionnaires measuring PTSD and the type of incidents they faced at work. For PTSD, the study used the full PCL-5 (8 items) adapted for daily use because it is an appropriate scale for monitoring symptoms of PTSD (Price et al., 2016).

5.3.5.1 List of daily incidents

The research team developed a list of the potentially traumatic incidents most frequently encountered by Saudi paramedics based on the annual report of SRCA ('Saudi Red Crescent Authority', 2021). We also drew on descriptions of potentially traumatic incidents generated in a recent qualitative study in Saudi paramedics (Alshahrani et al., 2022). The final list included general car accidents, car accidents involving children and women, other accidents involving children, incidents of disobedience to parents and the elderly, cardiac arrest and breathing problems, verbal and physical abuse towards paramedics, incidents involving murder, suicides, burn incidents, and drowning incidents.

5.3.6 Data analysis

The data were analysed using hierarchical linear modelling (HLM-8) (Raudenbush, 2004). Hierarchical linear modelling allows data to be analysed both within a level and across levels. Two levels of data were organized in this study. Level 1 described the within-participants variation (number of daily incidents and daily PTSD symptoms), whereas level 2 represented the between-participants variation (baseline measures of PTSD, coping strategies, social support, and demographic characteristics). At level 1, daily PTSD was used as an outcome variable, while the total number of incidents was estimated as a group mean centred predictor variable. At level 2, variables were grand mean centred. We examined the relationship between the total number of incidents and daily PTSD symptoms by examining the level 1 slope models, as well as testing the cross-level effects of coping strategy styles and social support (level 2 variables)

on daily PTSD symptoms and whether the relationships between the total number of incidents and daily PTSD symptoms (level 1) were moderated by coping styles and social support.

5.4 Results

Participants were 63 Saudi ambulance personnel from 16 different cities working for SRCA, recruited via email and text messages sent to participants distributed by their organization inviting them to complete daily diary surveys. Following this, 45 participants returned four end of shift questionnaires, and 51 returned two or more end of shift questionnaires. All participants were male and they had an age range between 20 and 53 (mean=32.64 years, SD=6.10). Years of service ranged between 1 to 29 years (mean=8.46 years, SD=5.90). Descriptive statistics for all variables are presented in Table 5.1.

Table 5.1 Descriptive statistics for level 1 (within-person, end of shift questionnaires) and level 2 variables (between participants, baseline questionnaire)

Variables	Mean	SD	Range
Level 1			
PTSD	14.16	6.08	0 – 26
Total incidents	2.28	0.84	1– 5
Level 2			
Age	32.64	6.10	20 – 53
Year of service	8.46	5.90	1 – 29
PTSD (SPTSS)	26.86	12.61	1 – 55
PTSD (PCL-5)	12.43	6.57	0 – 27
Active coping	31.80	7.37	17 – 51
Passive coping	11.84	3.86	6 – 19
Family and friend support	69.14	18.04	28 – 104
SRCA supports	10.43	11.46	13 – 52

Note: PTSD= Post-Traumatic Stress Disorders; SPTSS= Screen of Post-traumatic Stress Disorders Scale; PCL-5= Post-Traumatic Stress Disorders Check List-5; SRCA= Saudi Red Crescent Authority.

5.4.1 Research Question 1: Are daily incidents associated with daily PTSD symptoms?

Total number of daily incidents were positively associated with a higher number of daily PTSD symptoms indicating that paramedics who faced more incidents during a shift reported higher PTSD symptoms on those days ($\beta = 1.39$, $p = .001$) (see Table 5.2).

5.4.2 Research Question 2: Are coping styles associated with daily PTSD symptoms?

5.4.2.1 Research Question 2a: Is active coping style associated with daily PTSD symptoms?

There was no significant association between active coping style at baseline and daily PTSD symptoms, showing that background level of active coping did not predict PTSD symptoms among paramedics (β = 0.24, *p* = 0.11) (see Table 5.2).

5.4.2.2 Research Question 2b: Is passive coping style associated with daily PTSD symptoms?

Passive coping style reported at baseline was not found to be significantly associated with daily PTSD symptoms (β = 0.43, *p* = 0.052). This indicates that a higher background level of passive coping did not significantly predict subsequently higher daily PTSD symptoms, although there was a trend towards this (see Table 5.2).

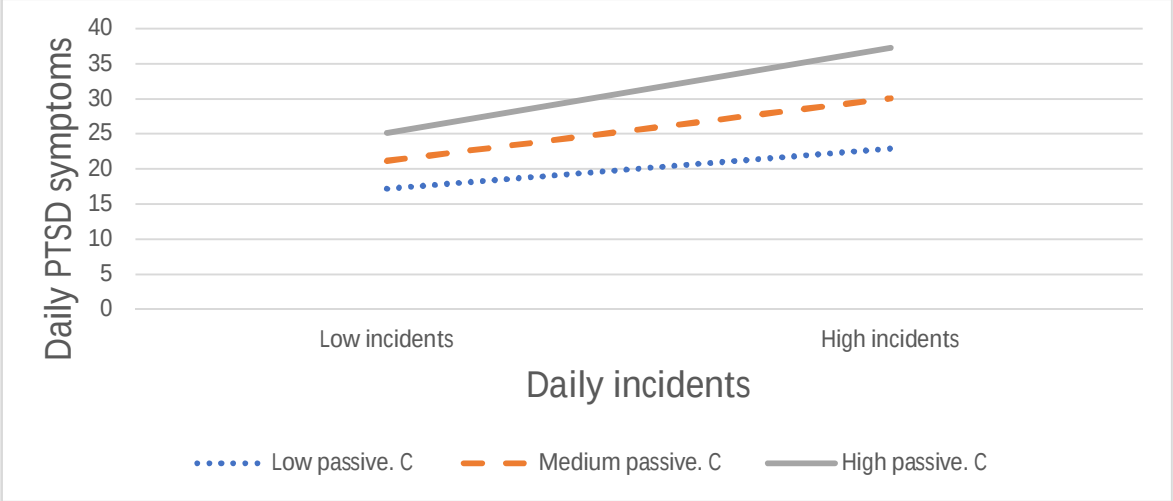
Table 5.2 The association between total incidents, coping styles and daily PTSD symptoms

HLM Effect	Symbol	Coeff	SE	p -value
Intercept: PTSD	β_{00}	13.78	0.78	<0.001
Level 1 slope: Total-incidents-PTSD	β_{10}	1.39	0.31	<0.001
Intercept:	β_{00}	10.59	0.92	<0.001
Active coping - PTSD	β_{01}	0.24	0.14	0.110
Level 1 slope: Total incidents - PTSD	β_{10}	1.3	0.35	<0.001
Active coping * incidents - PTSD	β_{11}	0.04	0.05	0.458
Intercept:	β_{00}	13.78	0.74	<0.001
Passive coping - PTSD	β_{01}	0.43	0.19	0.052
Level 1 slope: Total incidents - PTSD	β_{10}	1.35	0.27	<0.001
Passive coping * incidents - PTSD	β_{11}	0.19	0.06	0.007

5.4.2.3 Research question 2.c: Do active and passive coping styles moderate the association between daily incidents and daily PTSD symptoms?

The analyses found that active coping did not moderate the relationship between daily total incidents and daily PTSD symptoms (β = 0.04, *p* = 0.46), but that passive coping did moderate the association between number of daily incidents and PTSD symptoms (β = 0.19, *p* = .007) (see Table 2). This cross-level interaction was decomposed using simple slopes for multilevel modelling (Preacher, Curran, and Bauer(2006), and is shown in Figure 5.1. The results of these analyses showed that the association between daily incidents and daily PTSD symptoms became stronger as passive coping levels increased (see Figure 5.1).

Figure 5.1. Moderating effect of passive coping levels on the daily incidents and daily PTSD symptoms relationship



5.4.3 Research Question 3: Is social support associated with daily PTSD symptoms?

5.4.3.1 Research Question 3a: Is family and friends support associated with daily PTSD symptoms?

The results showed that there was a significant association between family and friends support and daily PTSD symptoms, such that the paramedics who felt more supported by family and friends reported lower daily PTSD symptoms (β = 0.09, *p* =0 .03) (see Table 5.3).

5.4.3.2 Research Question 3b: Is SRCA support associated with daily PTSD symptoms?

The analyses demonstrated that there was no significant association between SRCA support and daily PTSD symptoms (β = -0.43, *p* = 0.67).

5.4.3.3 Research Question 3c: Does social support moderate the association between daily incidents and daily PTSD symptoms?

The results showed that family and friends support did not moderate the relationship between daily total incidents and daily PTSD symptoms (β = -0.01, *p* = 0.41). Similarly, the SRCA support measure did not moderate the association between number of incidents and daily PTSD symptoms (β = -0.11, *p* = 0. 79) (see Table 5.3).

Table 5.3 The associations between social support, incidents and daily PTSD symptoms

HLM Effect	Symbol	Coeff	SE	p -value
Intercept:	β_{00}	13.79	0.72	<0.001
Family and friends support- PTSD	β_{01}	0.09	0.04	0.036
Level 1 slope:				
Total incidents- PTSD	β_{10}	1.34	0.31	<0.001
Family and friends support incidents - PTSD	β_{11}	-0.01	0.01	0.419
Intercept:	β_{00}	13.78	0.77	<0.001
SRCA support- PTSD	β_{01}	-0.43	0.06	0.671
Level 1 slope:				
Total incidents - PTSD	β_{10}	1.35	0.45	0.003
SRCA support incidents - PTSD	β_{11}	-0.11	0.04	0.798

5.5 Discussion

The primary aim of current study was to investigate whether a higher number of daily incidents were associated with greater levels of daily PTSD symptoms in Saudi paramedics. In addition, we aimed to investigate whether active and passive coping styles or social support predicted or moderated the association between daily incidents and daily PTSD symptoms. The results showed that a higher number of daily incidents was associated with greater daily PTSD symptoms indicating that the paramedics who had experienced more incidents during their shift reported more symptoms of PTSD

on those days. The findings showed that there were no direct associations between active coping, passive coping, SRCA social support, and daily PTSD symptoms, but there was a significant association between family and friends support and daily PTSD symptoms. However, while active coping and both forms of social support did not moderate the association between number of daily incidents and daily PTSD symptoms, passive coping did moderate the association between daily incidents and daily PTSD symptoms. Using simple slope analyses, we showed that higher levels of passive coping were associated with a larger impact of daily incidents on daily PTSD symptoms compared to lower levels of passive coping.

These findings are consistent with the model of coping proposed by Lazarus and Folkman (1984). In their transactional model of stress, they suggest that exposure to stressors is associated with greater strain, and that daily traumatic incidents can lead to chronic stress over time. Our findings also extend the existing literature by showing that daily traumatic incidents may contribute to mental health problems among ambulance personnel specifically (Alexander and Klein, 2001; Hruska and Barduhn, 2021; Jonsson and Segesten, 2004; Minnie et al., 2015; Van der Ploeg and Kleber, 2003). In a weekly diary study, Andel (2017), found that exposure to an increasing number of traumatic events was associated with higher levels of anxiety, depression, sleep disturbance and stress among paramedics. The present study extends on this previous study by measuring incidents and PTSD symptoms daily, and by researching in Saudi paramedics who face a high frequency of potentially traumatic events (Alshahrani, Johnson, and O'Connor, 2022; Mansuri, Al-Zalabani, Zalat, and Qabshawi, 2015). According to The Saudi General Authority for Statistics (2019), road accidents result in 19 deaths and 96 injuries every day in Saudi Arabia. Moreover, traffic incidents are not only the most frequently encountered type of incident treated by Saudi paramedics, but they are also the most stressful type of incidents they face in their daily work (Saudi Red Crescent Authority 2021; Karlsson, Niemelä, and Jonsson, 2020; Alshahrani et al., 2022). The stress of these incidents is exacerbated by paramedic shortages in Saudi Arabia. In 2019, there were 9015 paramedics in Saudi Arabia, which has a population of 34,268,528 (The General Authority for Statistics, 2019). This equates to one paramedic for every 3801 citizens and suggests that they have a large workload and are exposed to high levels of daily stress that may seriously threaten their health, well-being and performance (O'Connor, Thayer & Vedhara, 2021).

While we found that active coping did not appear to be linked with PTSD symptoms, higher levels of passive coping did appear to make paramedics vulnerable to experiencing PTSD in response to traumatic events. This finding supports previous studies which have shown that passive coping is linked with PTSD in paramedics

(Alshahrani et al., 2022; Haglund, Cooper, Southwick, and Charney, 2014). For example, Kerai et al (2017) and Razik, Ehring, and Emmelkamp (2013), investigated whether coping styles predicted PTSD symptoms among paramedics and found that higher levels of passive coping styles were associated with more PTSD symptoms. The present study extends on this previous research by showing that 1) passive coping can predict subsequent PTSD symptoms and 2) passive coping may exerts its effect by conferring vulnerability to potentially traumatic events.

In terms of social support, our finding showed that there was an association between daily PTSD symptoms and family and friends support, but SRCA support was not associated with PTSD symptoms. The positive finding for family and friends support is in line with some previous studies that found that family and friends support can be useful in reducing PTSD symptoms in paramedics and other health practitioners (Alexander and Klein, 2001; Halpern, Gurevich, Schwartz, and Brazeau, 2009a; Dunst, 2022). This may relate to the fact that paramedics tend to confide in their family and friends more than any other source of support when experiencing stressful circumstances (Avraham et al., 2014; E. Donnelly, 2012; Regehr et al., 2001). Therefore, they may prefer the family and friends support more than their organizational support (Donnelly, Bradford, Davis, Hedges, and Klingel, 2016).

5.5.1 Strengths and limitations

This is the first study, to our knowledge, that has examined the association between daily incidents and PTSD symptoms in paramedics. It benefited from a robust research design involving the use of multiple daily measurements to produce estimates. Limitations of the study included the use of a relatively small sample size which may have reduced the statistical power. However, this was partially compensated for by the inclusion of multiple data points for each participant and allowing each participants to act as their own control. Furthermore, there was some limited missing data points, as a small minority of participants did not complete all daily questionnaires.

5.5.2 Practical implications

Our findings suggest that paramedics who encounter a high frequency of potentially traumatic events are at higher risk of experiencing PTSD symptoms. As such, it would be helpful if organizations kept a record of the number of incidents attended by paramedics and contacted those who had been exposed to higher numbers to screen them for poor mental health symptoms and prioritise the provision of mental health support. Our findings also suggest that paramedics who use a higher degree of passive coping techniques may be more vulnerable to subsequently experiencing PTSD symptoms in response to potentially traumatic work events. As such, these

paramedics may particularly benefit from mental health support and should be prioritised for this.

Mental health support interventions which are provided should focus on reducing reliance on passive coping strategies and help paramedics to develop alternative strategies (Johnson et al., 2020). Also, it could be beneficial for paramedic health and well-being for organisations to provide interventions which aim to help paramedics develop stronger personal social support because organisational support as well as encouraging paramedics to seek support from each other may then increase their self-efficacy (Shakespeare-Finch, Rees, and Armstrong, 2015).

5.6 Conclusion

The current study found a strong association between higher number of daily incidents and a higher number of daily PTSD symptoms in paramedics. Passive coping was found to amplify the association between number of daily incidents and PTSD symptoms. These findings suggest that paramedic organisations ought to take steps to help protect paramedics during and after traumatic incidents exposure by creating and providing appropriate prevention and intervention programmes.

Chapter 6 General Discussion

6.1 Chapter summary

This chapter brings all the findings together and relates them back to the original aims of the thesis. Whereas previous chapters have provided detailed discussions of the findings of individual studies, this chapter focuses on the consideration of thesis limitations and recommendations for future research and interventions.

6.2 Thesis aims and summary

The thesis aimed to understand the impact of critical incidents on ambulance personnel, the factors which may affect the relationship between incident exposure and symptoms of trauma, and the support which organisations should provide. The thesis addressed these questions with a particular focus on Saudi Arabian ambulance personnel who face high rates of critical incidents. To address these questions, four pieces of research were conducted: a systematic review and meta-analysis, a qualitative study, a cross-sectional study, and a daily diary study. The systematic review and meta-analysis was reported in chapter 2. It was undertaken to analyse existing research that examined the effectiveness of psychological interventions to reduce PTSD, anxiety, depression, and stress in first responders. Two types of studies were included; randomised controlled trials (RCTs) or controlled before-after studies (CBAs). Meta-analysis was used to compare between cognitive behaviour therapy (CBT) versus other interventions, clinician delivered versus non-clinician delivered interventions, and individual-based versus group-based interventions for reducing symptoms of PTSD, depression, anxiety, stress, and burnout. In chapter three, a qualitative study was conducted to compare between Saudi and UK paramedics the types of potentially traumatic events they experienced, coping strategies they used, and types of support they preferred to receive. In chapter four, a survey study was presented to investigate the prevalence of PTSD symptoms among Saudi ambulance personnel, and to explore the association between PTSD symptoms and coping styles, and social support. In the fifth chapter, a daily diary study was conducted to examine the association between daily incidents, coping strategies, social support and daily PTSD symptoms among Saudi ambulance personnel.

6.3 Summary of key findings

6.3.1 Systematic review and meta-analysis

Fifteen studies were identified and included in the systematic review and meta-analysis (chapter two) to investigate the effectiveness of psychological interventions to treat PTSD (10 studies), anxiety (7 studies), depression (10 studies), stress (7 studies), and burnout (1 study) in first responders. The interventions were associated with a significant reduction in PTSD, depression, and anxiety, but no significant reduction was reported in stress. Moreover, the analyses showed that CBT was significantly more effective than other types of interventions for treating PTSD only, but not for treating depression symptoms. Also, it was found that interventions delivered by qualified clinicans led to better outcomes for reducing only PTSD symptoms than interventions delivered by non-clinicans, but not depression. In subgroup analyses, the meta-anaysis indicated that interventions were more effective in studies that were classified as having low risk of bias compared to those that had moderate to high risk of bias. There was a significant influence of the number of sessions delivered during an intervention, indicating that more sessions were more effective for reducing PTSD, but not for depression, anxiety and stress. A higher mean age was associated with greater intervention effectiveness for anxiety outcomes only, but not for PTSD, deperssion, and stress. The review also highlighted an overall lack of RCT studies in first responders, and in particular, in ambulance personnel, justifying the need for further research investigating the effectiveness of interventions among this group of professionals.

6.3.2 Cross-cultural qualitative study

The qualitative study examined the lived experience of potentially traumatic work events among paramedics in Saudi Arabia and the United Kingdom through semi-structured interviews with 16 ambulance personnel (eight participants from each culture; chapter three). Interviews were used to identify the impact of these traumatic events on paramedics, to comprehend how they cope with these events, and to determine which kind of support they preferred. Four key themes were identified in this study: 1) in both countries, some work events were inherently more stressful than others, particularly those including physical injury, vulnerable victims, or potential threats to paramedics themselves; 2) pressures within organisations and problems interpersonally between colleagues compounded the negative impact of stressful events; 3) there was both convergence and divergence in coping strategies between cultures, with paramedics in both countries using physical activity, but only Saudi paramedics using only spiritual coping; and 4) paramedics in both cultures preferred formal and confidential support over informal support or group interventions. These

findings suggest that in order to help ambulance service organisations to improve the wellbeing of ambulance workers, they should monitor traumatic event exposure to identify paramedics who may be at high risk of trauma and develop formal, confidential programs to offer paramedics psychological support.

6.3.3 Cross-sectional survey study

A survey study was conducted to investigate the prevalence rate of PTSD among Saudi paramedics who were working in the Saudi Red Crescent Authority (SRCA), and to examine the association between active and passive coping strategies. Active coping refers to problem-solving, seeking help, making positive meaning from experiences, altering stressful appraisals and not avoiding stressful situations. While passive coping is defined as maladaptive strategies in stressful situations, such as self-blame and avoidance of problems. A total of 217 paramedics participated in the study, who completed questionnaires that assessed PTSD symptoms (the Screen of Post-Traumatic Stress Disorders; SPTSS), passive and active coping strategies (Brief COPE Scale); and two forms of social support: support from friends and family, and support from their organization. The results indicated that 46% of participants experienced at least one PTSD symptom, 28.57% met the criteria for partial PTSD, and 17.5% met the criteria for full PTSD. Furthermore there was an association between higher levels of PTSD symptoms and greater use of passive coping strategies, and lower perceptions of family and friends support. To investigate factors which distinguished between PTSD caseness versus non-PTSD caseness, a binary logistic regression was performed and results indicated that passive coping was the only factor significantly associated with PTSD. Active coping, family and friends support and Red Crescent Supportwere not significantly associated with PTSD caseness. The results of this survey study helped to improve understanding of the prevalence of PTSD symptoms among Saudi ambulance personnel which will help provide appropriate psychological care before and after potentially traumatic incidents. It also identified coping style and social support as potentially important factors in contributing to PTSD symptoms, although as a cross-sectional study, causality could not be established.

6.3.4 Daily diary study

No previous study has investigated the association between daily traumatic incidents with daily PTSD symptoms among ambulance personnel. Repeated trauma exposure, difficulties associated with the interaction between critical daily incidents, the shiftwork system, long working hours, and short recovery times between events may increase ambulance personnel’s stress and compromise their mental health, and well-being (Beaton and Murphy, 2013; Lawn et al., 2020). Therefore, the main aim of the fourth

study was to examine the relationship between daily incidents and daily level of PTSD symptoms using a daily diary approach. Also, this study aimed to explore the relationships between coping styles and subsequent daily PTSD symptoms, as well as the links between social support and daily PTSD symptoms. To achieve these aims, 51 Saudi ambulance personnel participated in this study. The results indicated that exposure to greater numbers of daily incidents was associated with higher levels of daily PTSD symptoms. No direct relationship was found between active coping, passive coping, SRCA social support, and daily symptoms of PTSD, but there was a significant association between family and friends support and daily PTSD symptoms. However, passive coping moderated the association between daily incidents and daily PTSD symptoms, such that higher levels of passive coping conferred vulnerability to reporting more daily PTSD symptoms in response to more frequent critical incidents than lower levels of passive coping. Active coping, family and friends support, and organisational support were not found to moderate the association between incidents and daily PTSD symptoms. These findings may help ambulance organisations to provide interventions to assist paramedics. In particular, these findings indicate that organisations should 1) focus support on paramedics who have faced higher numbers of critical incidents, and who report a greater use of passive coping strategies and 2) aim to help paramedics strengthen their personal social support from family and friends.

6.4. Theoretical foundations

The results of this thesis can be considered in light of the PTSD theories presented in chapter 1. The systematic review and meta-analysis found that CBT is more effective than other interventions for reducing PTSD symptoms among first responders. This result supports the cognitive model proposed by Ehlers and Clark (2000). This model emphasizes the processing of stimuli during trauma as one of the factors which leads to PTSD symptoms (Brewin and Holmes, 2003) and thus, this is what CBT treatment focuses on. Moreover, the cognitive approach is supported by the findings from the qualitative study in chapter 3 which suggested that paramedics in both Saudi Arabia and UK cultures preferred formal and confidential support to reduce trauma. According to Mannarino et al. (2014), trauma-focused cognitive behavioral therapy (TF-CBT) emphasises the delivery of formal and confidental processes between the therapist and client because this procedure makes the client feel comfortable that their privacy is protected.

In addition, the situationally accessible memories (SAM) described in Dual Representation Theory were reflected and supported by the descriptions of

paramedics in the qualitative study (chapter 3). Here, they described the emotional way the traumatic events impacted them, which involved the accurate describing of traumatic details they faced including smells, sounds, and scenes. According to Moss (2016), the SAM system records the details of certain traumatic events, such as smells, sounds, and scenes. Therefore, flashbacks are often more detailed and emotional than ordinary memories, as was described by the paramedics included in chapter 3.

Finding a strong relationship between higher levels of PTSD symptoms and greater use of passive coping strategies (chapter 4), and the discovery that passive coping moderated the association between daily incidents and daily PTSD symptoms (chapter 5) supports emotional processing theory. Foa and Rothbaum (1998), suggested that people who focus on negative appraisals of responses (including during and after events) are at a higher risk of traumatic events leading to chronic PTSD. The concepts of passive coping and negative appraisals are closely linked, with stressors that are perceived as threatening and demand levels that exceed perceived coping capabilities (Olff, Langeland, and Gersons, 2005). As such, our finding that great passive coping is linked with greater PTSD is supportive of emotional processing theory.

6.5 Strengths and limitations

The thesis has several strengths and limitations. The researcher and the supervisory team were diverse, and brought a range of perspectives to the research questions. The PhD researcher was a Saudi native and the supervisory team included UK academic experts in health, clinical and organisational psychology. The supervisory team also included a UK paramedic field supervisor who provided support with the research conducted in Chapter 3. To support cultural sensitivity, in the qualitative study in chapter 3, the interviews were conducted in participants' first languages in both Saudi (Arabic language) and UK (English language), which is not always possible in cross-cultural research. In addition, this thesis incorporated a multimethod approach to address its research questions. Of particular note was the use of a daily diary design, utilised less in frontline ambulance personnel, which allowed each participant to act as their own control. It can also be viewed as a more intensive approach which enabled the near real time measurement of daily incidents and PTSD symptoms.

One of the limitations of this thesis is that the empirical quanitative studies included in Chapters 4 and 5 used self-report measures to evaluate PTSD symptoms which may lead to overestimation of the prevalence of PTSD symptoms (Terhakopian, Sinaii,

Engel, Schnurr, and Hoge, 2008). That said, the rates were similar to other comparable studies (Alaqeel et al., 2019; Khan et al., 2020).

Moreover, only four databases were used in the systematic review reported in Chapter 2 (Embase, PsycInfo, CINAHL and the Cochrane Register of Controlled Trials), which may explain the small number of included studies (15 studies). While Embase captures all records indexed by MEDLINE and 98% of those indexed by PubMed (Libguides Research, 2023), it is possible that other databases such as Web of Science may have identified other relevant articles.

It should also be noted that in all the empirical studies, all Saudi ambulance personnel who participated were males because in Saudi Arabia this profession employs only males (in the SRCA), and this may affect the comparison with previous studies from other countries. Some of these studies have suggested that gender plays a significant role in the rate of PTSD morbidity and prevalence, with rates higher in female ambulance personnel (e.g., Reti, de Terte, and Stephens, 2022; Soravia, Schwab, Walther, and Müller, 2021).

Finally, three studies of this thesis (i.e., the systematic review, the qualitative interview and the survey study) were conducted before the Covid-19 pandemic, and it was difficult to conduct the fourth study (daily diary approach) to examine the impact of the pandemic on the Saudi ambulance personnel due to the strict lockdown conditions in Saudi Arabia. The COVID-19 pandemic has substantially impacted the physical and psychological health of healthcare professionals and made conducting research in this group much more challenging (Al-Ghunaim et al., 2021; O'Connor, Aggleton, et al., 2020). Stress levels, anxiety, depression, and insomnia symptoms have increased dramatically among healthcare workers (Spoorthy, Pratapa, and Mahant, 2020) and it is therefore possible that if these studies were conducted now, findings might be different. A recent meta-analysis conducted by Huang et al (2022), to estimate the prevalence rate of depression, anxiety, and stress among first responders during the COVID-19 pandemic, revealed some alarming statistics. They found that the pooled prevalence for depression, anxiety, and stress was 31%, 32%, and 17%, respectively. These results were significantly higher than the finding by Petrie et al (2018), who estimated the prevalence of depression and anxiety was 15% for each. Therefore, it is likely the prevalence of PTSD symptoms in Chapter 4, in particular, may have increased since my studies were concluded.

6.6. Implications

6.6.1. Implications for ambulance personnel

This thesis found that exposure to more frequent traumatic events and the use of passive coping strategies were associated with PTSD symptoms among ambulance personnel. Taken together, these findings highlight the need for interventions and support to help mitigate the impact of trauma exposure on the mental health of ambulance workers. In particular, these finding suggest that:

1. Ambulance personnel should avoid using passive coping strategies by employing alternative coping methods, instead of passive coping. Even though there is no evidence that active strategies will help, it has been shown that if passive strategies can be swapped for active strategies, the risk of heightened PTSD will likely be reduced.
2. Paramedics who are exposed to a high frequency of incidents at work should be aware that this will put them at risk of experiencing trauma symptoms; if they recognise that they are experiencing trauma symptoms, they should access the support services available to them.

6.6.2. Implications for ambulance organisations

Based on the high rate of PTSD among ambulance personnel identified in this thesis, management within ambulance organisations should adopt measures to reduce ambulance personnel' PTSD through the following:

1. Training ambulance personnel in dealing with traumatic events, educating them about the risks of incident exposure and using passive coping strategies, and increasing their awareness of the support services which are available to them via their organisation.
2. Findings from Chapters 3 and 5 suggested that it would be helpful for ambulance organisations to develop programs to monitor potential traumatic incidents. These programs could include keeping a record of the number of incidents attended by paramedics. In addition, it may also be appropriate to contact those who have experienced a high number of incidents in an effort to screen them for symptoms of poor mental health and to prioritize mental health assistance.
3. Overall, the study findings indicate that ambulance personnel need a greater amount of support for their mental health to help prevent against PTSD symptoms. In Saudi Arabia, there is only one Psychological Support Unit (PSU) located in Riyadh (the Saudi capital), and it serves all paramedics working in SRCA in all regions of Saudi Arabia, and unfortunately, the number of paramedics who visit it is very few (Alzahrani, abd Allah Mahmod, Bakhamis, and Al-Surimi, 2017). Thus, the SRCA must establish an integrated psychological support unit in the main

centres of each region (13 centres) so that paramedics can be served in receiving the necessary assistance close to their place of residence.

6.7 Recommendations: Future research and interventions

There is a lack of studies using RCT designs testing the effectiveness of interventions for PTSD among first responders and ambulance personnel. Findings from the Chapter 2 indicated that 12 out 15 of included studies were RCT interventions. RCT is the most rigorous method of assessing the cost-effectiveness and cause-effect relationship between treatment and outcome

In addition to further, rigorous studies of interventions for PTSD in ambulance personnel, there is a need for a wider range of evidence-based interventions to be tested. To date, few interventions have been tested in ambulance personnel and those which have been, have involved EMDR (Behnammoghadam et al., 2019; Ignacio et al., 2013) and CISD (Wee et al., 1990). In other groups, interventions using CBT and EMDR hold the strongest evidence bases. As such, it would be useful to know if these interventions are also effective in ambulance personnel.

It should also be noted that the COVID-19 pandemic led to significant changes in the provision of healthcare services, limited direct access to doctors, suspension of planned treatments and delays in medical consultations (Wojtysiak and Zielińska-Więczkowska, 2022). Due to these changes, it cannot be assumed that all previous research study results will still be applicable and generalisable to the present time. Therefore, there is a need for ongoing research into psychological wellbeing of ambulance personnel.

Finally, it may be interesting to focus on spiritual beliefs as a potential avenue for developing future interventions for Saudi paramedics. The current research found that Saudi ambulance personnel used religious coping mechanisms, while the ambulance workers in the UK did not. A small number of interventions for first responders and healthcare professionals incorporate spirituality as a significant component. The reason may be that most existing interventions have been developed in Western cultures where spirituality is less of a focus or coping strategy. However, Alghamdi (2015), found that the prayer, reading of the Holy Qur'an, and participation in religious rituals are considered to be the most effective treatments for mental disorders in Saudi culture. Therefore, this information may be useful in designing prevention and intervention programs.

6.8 Conclusion

The investigation of risk factors for PTSD symptoms in ambulance personnel continues to be of interest to researchers and specialists in emergency medical services. This thesis investigated some of the risk factors and potential interventions of PTSD among ambulance personnel. The main findings of this thesis highlighted that exposure to a greater number of incidents and a greater tendency to use passive coping strategies were associated with higher levels of PTSD symptoms in ambulance personnel. Furthermore, the results indicated evidence that interventions are effective for treating and reducing PTSD symptoms in this population, but they require improvements and to be customized to beliefs and cultures of ambulance personnel. Following the novel studies conducted within this thesis, several suggestions have been made throughout each of the chapters regarding both the changes that are required and strategies or interventions that can be implemented on an individual or organisational level to improve ambulance personnel well-being and to help reduce PTSD symptoms.

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NB: * = article included in systematic review

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List of Abbreviations

ACT	Acceptance and Commitment Therapy
APA	American Psychiatric Association
BDI	Beck Depression Inventory
BEP	Brief Eclectic Psychotherapy
BT	Behaviour Therapy
CAPS	Clinician Administered Posttraumatic stress disorders Scale
CBAs	Controlled Before-After designs
CBT	Cognitive Behaviour Therapy
CISD	Critical Incident Stress Debriefing CISD
CPTSD	Complex Post-Traumatic Stress Disorder
DASS	Depression Anxiety Stress Scales
DSM	Diagnostic and Statistical Manual of Mental Disorders
DSO	Disturbances in Self-Organization
EFC	Emotion-Focused Strategies
EMDR	Eye Movement Desensitisation Reprocessing
EMDs	Emergency Medical Dispatchers
EMS	Emergency Medical Service
EMT	Emergency Medical Technician
GAD	Generalised Anxiety Disorder questionnaire
GCC	Gulf Cooperation Council
GHQ	General Health Questionnaire
HADS	Hospital Anxiety and Depression Scale

ICD	International Classification of Diseases
IES	Impact of Event Scale
IES-R	Impact Event Scale-Revised
JSS	Job Stress Survey
KAMC	King Khalid Abdul Aziz Medical City
KSA	Kingdom of Saudi Arabia
MBRT	Mindfulness-Based Resilience Training
M-PTSD	Mississippi Scale for Post-Traumatic Stress Disorder
NET	Narrative Exposure Therapy
NHS	National Health Service
NICE	National Institute for health and Clinical Excellence
PCL	Post-Traumatic Stress Disorder Checklist
PFC	Problem-Focused Coping
PHQ	Patient Health Questionnaire
PSI	Police Stress Inventory
PSS	Perceived Stress Scale
PSU	Psychological Support Unit
PTG	Post-Traumatic Growth
PTSD	Post-Traumatic Stress Disorder
PTSS	Post Traumatic Symptoms Scale
RCTs	Randomized Controlled Trial
SAMs	Situationally Accessible Memories
SPTSS	Scale of Posttraumatic Stress Symptoms
SRCA	Saudi Red Crescent Authority

S-reps	Sensation-near representation
SRS-PTSD	Self-Rating Scale for Posttraumatic stress disorders
TF-CBT	Trauma-Focused Cognitive Behaviour Therapy
UK	United Kingdom
VAMs	Verbally Accessible Memories
WHO	World Health Organization

Appendix A

Chapter 2 (Systematic Review) Appendices

A.1 PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	20
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	n/a for thesis
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	20 ,21
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	22
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	22
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	23
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	24
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix A.2

Section/topic	#	Checklist item	Reported on page #
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	24
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	24
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	25, and Figure 2.1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	24
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	25
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	25,26
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	25
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	24, 25
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	25, 26
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	28
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	34
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 2.1.
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	35

Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	39
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	37,38
DISCUSSION			
Summary of evidence	24	Summary of evidence	39.40
Limitations	25	Limitations	42
Conclusions	26	Conclusions	43
FUNDING			
Funding	27	Funding	n/a for thesis

A.2 Search strategy for EMBASE

Database: Embase Classic+Embase <1947 to 2021 September 08>

Search Strategy:

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1 Ambulances.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (2759)

2 Emergency Medical Technicians.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (1214)

3 Air Ambulances/ (2928)

4 Emergency Medical Services.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (12512)

5 paramedic*.tw. (13167)

6 ems.tw. (19351)

7 emt.tw. (37368)

8 prehospital.tw. (18005)

9 pre-hospital.tw. (8679)

10 first responder*.tw. (3358)

11 emergency medical technicians.tw. (1071)

12 emergency services.tw. (5913)

13 ambulance*.tw. (17448)

14 HEMS.tw. (1097)

15 out-of-hospital.tw. (19583)

16 field triage.tw. (379)

17 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 (125445)

18 stress disorders, traumatic/ or psychological trauma/ or stress disorders, post-traumatic/ or stress disorders, traumatic, acute/ or stress, psychological/ or re experienc*.mp. or traumatic neuros*.mp. or traumatic stress.mp. or posttraumatic*.mp. or post traumatic*.mp. or stress disorder*.mp. or acute stress.mp. or ptsd.mp. or asd.mp. or desnos.mp. or extreme stress.mp. or flashback*.mp. or flash back*.mp. or psych* stress.mp. or psych* trauma*.mp. or psycho?traumv.tw. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (265644)

19 trauma*.mp. and (avoidance or grief or horror or death* or nightmare* or night mare* or emotion*).tw. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (64454)

20 burnout, professional/ (1513)

21 (fatigue* or burnout* or burntout* or "burn* out*").tw. (194317)

22 Depression/ (404582)

23 depress*.tw. (699689)

24 Depressive disorders.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (15199)

25 depressive disorders, major.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (38)

26 Anxiety.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (421976)

27 Anxiety Disorders.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (31717)

28 (anxiety or anxious).tw. (323018)

29 mood disorders.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (24127)

30 Mental Disorders.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (72936)

31 distress*.tw. (199135)

32 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 (1621178)

33 (treat* or psychotherap* or psycho therap* or talk* therap* or therapeutic technique* or therapist* or third wave).mp. or time limited.tw. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (9572962)

34 (((behaviour* or behavior*) adj2 cognitiv*) or cbt or ccbt or ((behav* or cognitive*) adj3 (intervention* or manag* or program* or restructure* or therap* or treat*)) or (stress inoculation adj2 (intervention* or program* or therap* or train* or treat*)) or (behav* adj2 activat*) or ((trauma adj (based or focused or led)) or exposure based or prolonged exposure)).tw. (184522)

35 emotion focused therapy/ or sympathy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (1973)

36 (((compassion or emotion* or emotive*) adj (based or focused or led)) or emotional processing or ((compassion or emotion* or emotive*) adj3 (coach* or intervention* or program* or therap* or treat*))).ti,ab. (15306)

37 exposure therapy/ or narrative therapy/ or virtual reality exposure therapy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (2263)

38 (((augmented or virtual) adj2 reality) or (virtual adj (environment or restorative)) or ((exposure or implosive or virtual reality) adj2 (intervention* or program* or therap* or train*))).ti,ab. (28032)

39 ((imagery adj2 (rehears* or re hears*)) or (((lower* or reduc*) adj3 (bad dream* or nightmare*)) and (intervention* or program* or therap* or treat*)) or ((intervention* or program* or therap* or treat*) adj3 nightmare*)).mp. or ((presleep or presleep) adj2 imagery).ti,ab. (521)

40 "debriefing (psychological)".mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (2)

41 eye movement desensitization reprocessing.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (54)

42 Psychotherapy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (118392)

43 behavior therapy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (50247)

44 (behavi?r adj3 therap*).tw. (9655)

45 cognitive therapy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (44939)

46 (cognitive adj3 therap*).tw. (35263)

47 (relax* adj3 (technique* or therap*)).tw. (5677)

48 exp mind body therapies/ (62461)

49 guided imagery.tw. (1132)

50 "imagery (Psychotherapy)"/ (1490)

51 PSYCHOTHERAPY, GROUP.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] (603)

52 ((psychoeducation or psycho-education) adj2 group*).tw. (597)

53 (group* adj3 (therap* or program*)).tw. (74234)

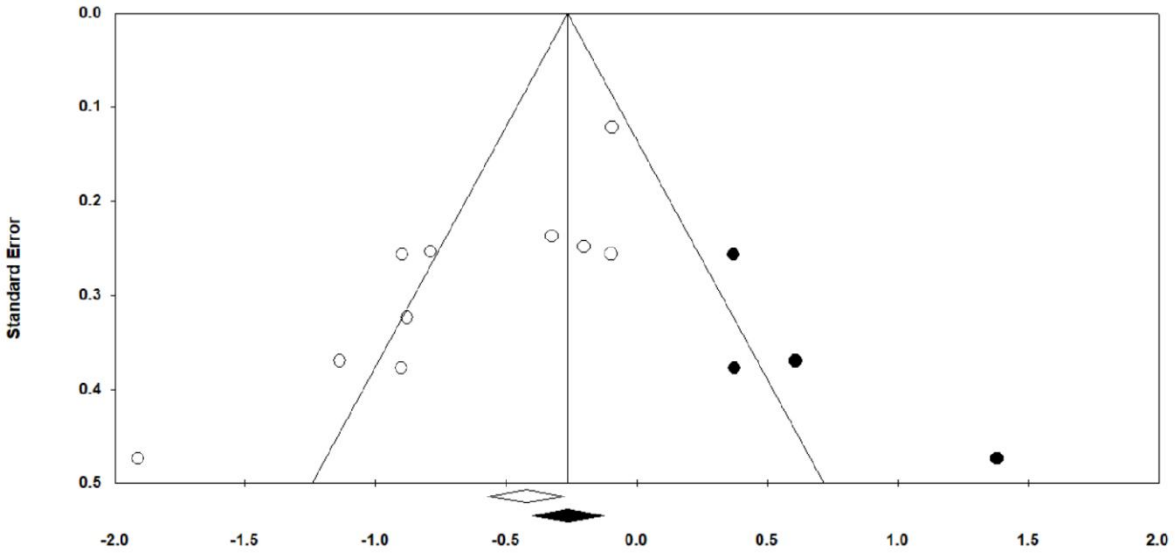
54 mindfulness.tw. (11859)

55 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 (9746068)

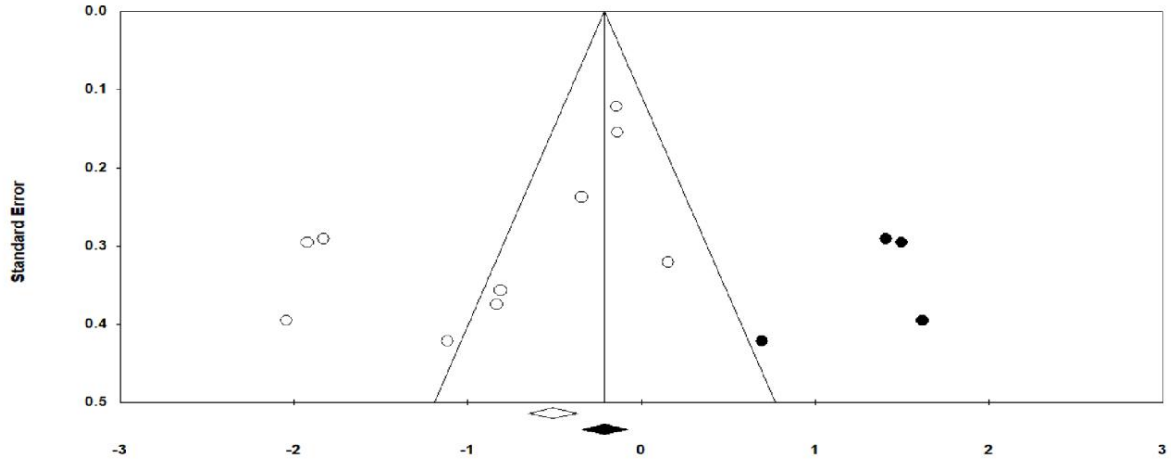
56 17 and 32 and 55 (3112)

****

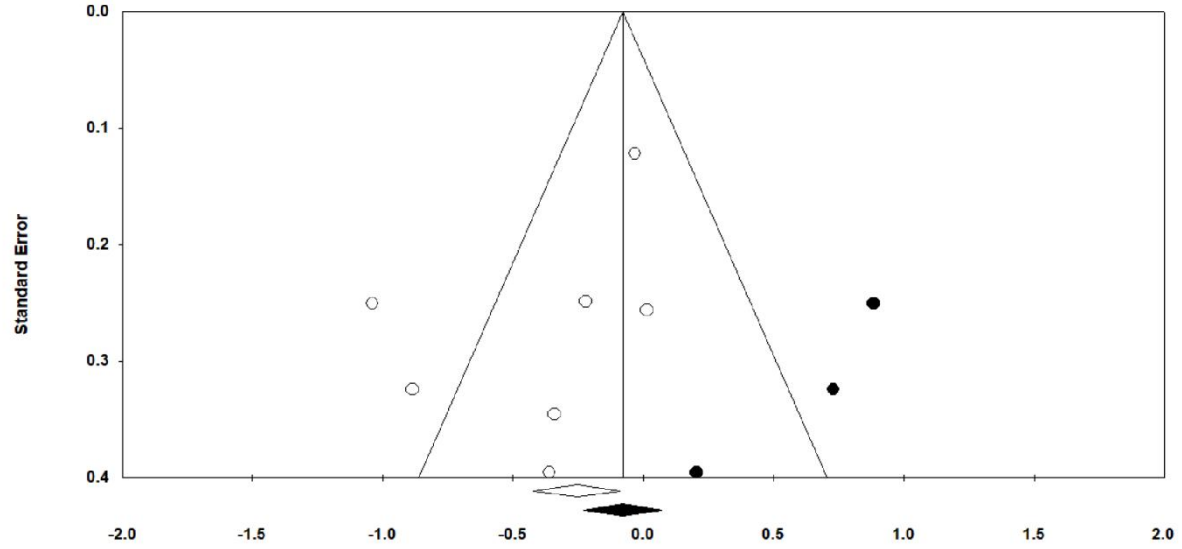
A.3 Funnel plot of standard differences of mean versus standard errors for depression



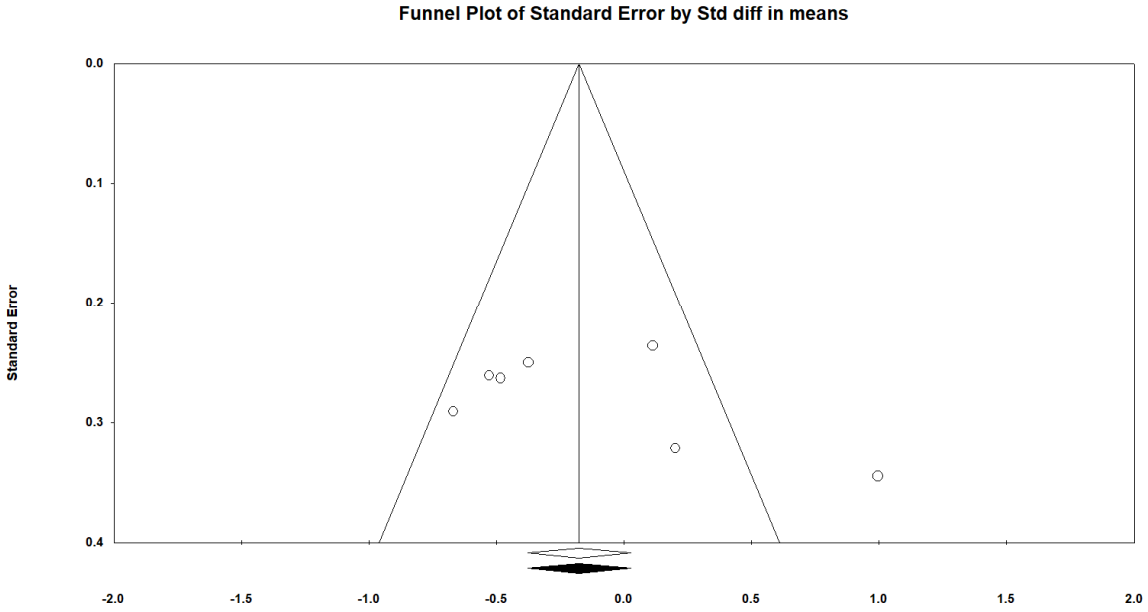
A.4 Funnel plot of standard differences of mean versus standard errors for PTSD



A.5 Funnel plot of standard differences of mean versus standard errors for anxiety



A.6 Funnel plot of standard differences of mean versus standard errors for stress



Appendix B

Chapter 3 (qualitative study) Appendixes

B.1 The interview schedules

Opening

Hello, my name is Khalid. I'm a researcher from the University of Leeds. This is the time we agreed to speak by email – is this still ok with you?

Before beginning the interview, I would like to give you some information about this research. I am interested in understanding the stressful events paramedics experience, how you cope with these and the support you would like. In this interview, I will ask you some questions about these topics. It is important to know that this interview is only for research purposes and if there anything you would rather not respond to, you can just decline to answer.

Timeframe: This interview should take approximately 45 minutes to complete.

Have you had a chance to read the Participant Information Sheet?

[Check participants are happy with the information on the Participant Information Sheet and take informed consent, which will be recorded]

To begin with, can you tell me a little bit about yourself? ***[Demographics: the demographics will NOT be recorded]***

- What is your gender?

- What is your age?

- How many years and months have you been working in ambulance services?

- How would you describe your ethnicity?

- Which region do you work in?

- How many hours do you work on average in each week?

SECTION 1: Types of stressful events experienced at work *(this sections aims to explore the nature of stressful events in paramedics' work and the features of these events which paramedics find most stressful)*

- Which kinds of events do you find stressful at work?

- Can you describe any particular stressful events you've experienced?

- What was it about this/these events that you found difficult?

- What thoughts did you have about this/these event/s afterwards?

- In which other ways did this/these event/s affect you? (Emotional or physical effects)

- How long did you have these thoughts/emotions/other problems after the event/s?

- How did this/these event/s affect your performance in work?

- How did this/these event/s affect your personal life?

- How did they affect your family life?

- How did they affect your social life?

SECTION 2: Coping strategies *(This section aims to uncover the ways in which paramedics cope with stressful event and how effective these coping strategies are)*

1. Which things helped you to cope with the event when it was happening?

- Do you have any coping strategies you use?

- How did you learn this/these coping strategy/strategies? (education? experience?)

- How helpful did you find using this/these strategy/strategies?

2. Which things helped you to recover from the impact of this/these event/s?

- Did you organisation provide you with any formal support like a debriefing meeting or one-to-one psychological support?

- Did you receive any support from colleagues?

- Did you receive any support from family?

- Did you use any self-help or seek psychological support yourself?

- How helpful did you find this/these support/strategies? Would you do the same thing again in the future?

SECTION 3: Preferences for support *(this section aims to uncover the types of support or interventions paramedics would like to help them cope with critical events in the future)*

[For paramedics who received formal support from their organisation]

1. Which things did you like about the Support/intervention your organisation provided you with?

2. Would you want to be offered something similar in future?

3. Would you rather be offered something different in future? How would it be different?

[For paramedics who received no formal support from their organisation]

1. What kind of support or help would you have liked your organisation to offer you?

- Would you have appreciated a formal intervention or rather better informal support (e.g., from colleagues)?

- Who would you want to provide this (a supervisor? A senior paramedic from another organisation? A psychologist?)

- If you would want a formal intervention, what format would you want to receive this intervention in? (Individual or group?)

- If you would want a formal intervention, what kind of things would you want the intervention to include (e.g., psychological training, or therapeutic support)?

- If you would prefer more informal support, how do you think this could be improved?

Closing

I appreciate the time you took out to take part in this interview. Is there anything else you would like to add before we finish this interview?
Thank you again, your responses will be very helpful.

Appendix C

Chapter 4 (cross-sectional study) Appendixes

C.1 Screen for Posttraumatic Stress Symptoms (SPTSS)

Please answer to these items by fill the box under the alternative which reflects the number of occurring times of these things during the last month. These are no true or false answers, your answer just expresses about your feelings.

0= Not at all, 1=1 or 2 times, 2= Almost every day, 3=About once every day, 4=More than once every day

N	Items					
1	I don't feel like doing things that I used to like doing.	0	1	2	3	4
2	I can't remember much about bad things that have happened to me.	0	1	2	3	4
3	I feel cut off and isolated from other people.	0	1	2	3	4
4	I try not to think about things that remind me of something bad that happened to me.	0	1	2	3	4
5	I feel numb: I don't feel emotions as strongly as I used to.	0	1	2	3	4
6	I have trouble concentrating on things or paying attention to something for a long time.	0	1	2	3	4
7	have a hard time thinking about the future and believing that I'm going to live to old age.	0	1	2	3	4
8	I feel very irritable and lose my temper.	0	1	2	3	4
9	I avoid doing things or being in situations that might remind me of something terrible that happened to me in the past.	0	1	2	3	4
10	I am very aware of my surroundings and nervous about what's going on around me.	0	1	2	3	4
11	I find myself remembering bad things that happened to me over and over, even when I don't want to think about them.	0	1	2	3	4
12	I get startled or surprised very easily and "jump " when I hear a sudden sound.	0	1	2	3	4
13	I have bad dreams about terrible things that happened to me.	0	1	2	3	4
14	I get very upset when something reminds me of something bad that happened to me.	0	1	2	3	4
15	I have trouble getting to sleep or staying asleep.	0	1	2	3	4
16	When something reminds me of something bad that happened to me, I feel shaky, sweaty, nervous and my heart beats really fast.	0	1	2	3	4
17	I suddenly feel like I am back in the past, in a bad situation that I was once in, and it's like it was happening it all over again.	0	1	2	3	4

C.2 Brief COPE

These items deal with ways you've been coping with the stress in your life since you found out you were going to have to have this operation. There are many ways to try to deal with problems. These items ask what you've been doing to cope with this one. Obviously, different people deal with things in different ways, but I'm interested in how you've tried to deal with it. Each item says something about a particular way of coping. I want to know to what extent you've been doing what the item says. How much or how frequently?
Don't answer on the basis of whether it seems to be working or not—just whether or not you're doing it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true for you as you can.

1 = I haven't been doing this at all, **2** = I've been doing this a little bit, **3** = I've been doing this a medium amount, **4** = I've been doing this a lot

N	Items				
1	I've been taking action to try to make the situation better.	1	2	3	4
2	I've been thinking hard about what steps to take.	1	2	3	4
3	I've been trying to find comfort in my religion or spiritual beliefs	1	2	3	4
4	I've been praying or meditating.	1	2	3	4
5	I've been trying to get advice or help from other people about	1	2	3	4
6	I've been trying to come up with a strategy about what to do.	1	2	3	4
7	I've been looking for something good in what is happening.	1	2	3	4
8	I've been getting help and advice from other people.	1	2	3	4
9	I've been turning to work or other activities to take my mind	1	2	3	4
10	I've been getting comfort and understanding from someone.	1	2	3	4
11	I've been trying to see it in a different light, to make it seem more positive.	1	2	3	4
12	I've been getting emotional support from others.	1	2	3	4
13	I've been concentrating my efforts on doing something about	1	2	3	4
14	I've been giving up the attempt to cope	1	2	3	4
15	I've been blaming myself for things that happened.	1	2	3	4
16	I've been giving up trying to deal with it.	1	2	3	4
17	I've been criticizing myself.	1	2	3	4
18	I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.	1	2	3	4
19	I've been using alcohol or other drugs to help me get through it.	1	2	3	4

C.3 Social Support Scale

These items deal with social support receive from family, friends, or organisations. Could you please estimate how much you have received social support from these sources: family friends, and Saudi Red Crescent Authority SRCA. The first 11 items measure the types of social support: emotional, informational instrumental. The last two items are to measure the satisfaction with the received social support for each source.

0=Not at all, 1=Little, 2= Moderate, 3= very much

N	Items	Family				Friends				SRCA			
1	Helped me to feel better	0	1	2	3	0	1	2	3	0	1	2	3
2	Made me feel that I'm really an important person	0	1	2	3	0	1	2	3	0	1	2	3
3	Expressed to me that they understand my feelings	0	1	2	3	0	1	2	3	0	1	2	3
4	Helped me to deal with the traumatic event	0	1	2	3	0	1	2	3	0	1	2	3
5	Provided me information about traumatic events	0	1	2	3	0	1	2	3	0	1	2	3
6	Provided me with a place when I needed it	0	1	2	3	0	1	2	3	0	1	2	3
7	Helped to accept the incident as an accident	0	1	2	3	0	1	2	3	0	1	2	3
8	Talked with me about the decisions that I made about the incident	0	1	2	3	0	1	2	3	0	1	2	3
9	Said things that helped me to understand the trauma	0	1	2	3	0	1	2	3	0	1	2	3
10	Encouraged me to be in touch with others	0	1	2	3	0	1	2	3	0	1	2	3
11	Let me know that they will be around if I need assistance	0	1	2	3	0	1	2	3	0	1	2	3
12	I feel satisfied about the support that I have received	0	1	2	3	0	1	2	3	0	1	2	3
13	I feel that the support that I have received was helpful	0	1	2	3	0	1	2	3	0	1	2	3

Appendix D

Chapter 5 (daily diary study) Appendixes

D.1 End of shift questions

Please generate a unique participant code to be used should you wish to recall your data. Use the first 2 letters of your surname, the 2 digits of the date of the month in which you were born, plus the last letter of your first name.

E.g. My surname is Alshahrani, I'm born on the 17th of the month, and my first name is Khalid. Therefore my unique participant code would be: AL17D

Unique participant code:

Please provide your email address so that we can contact you to a) send email reminders for filling in the questions, b) so that we can send you a summary of results once the study is completed).

Please also provide your mobile phone number so we can send reminders by text:

PCL-5

During your LAST SHIFT, how much were you bothered by

N	Items	0	1	2	3	4
a	Repeated, disturbing, and unwanted memories of the work-related stressful experience?	0	1	2	3	4
b	Feeling very upset when something reminded you of he stressful experience?	0	1	2	3	4
c	Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
d	Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	0	1	2	3	4
e	Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	0	1	2	3	4
f	Loss of interest in activities that you used to enjoy.	0	1	2	3	4
g	Being "super alert" or watchful or on guard?	0	1	2	3	4

h	Having difficulty concentrating?	0	1	2	3	4

0= **Not at all**, 1= **A little bit**, 2= **Moderately**, 3= **Quite a bit**, and 4= **Extremely**

List of events

During your LAST SHIFT, did any of the following cases happen to your patients?

Cases	Yes	No
Car accidents	⬭	⬭
Car accidents involving children or women	⬭	⬭
Other kid's accidents	⬭	⬭
Incidents of disobedience to parents and the elderly	⬭	⬭
Cardiac arrest and breathing problems	⬭	⬭
Verbal and physical abuse towards you by relatives of patients and bystanders	⬭	⬭
Incidents involving murder or manslaughter	⬭	⬭
Suicides	⬭	⬭
Burn incidents	⬭	⬭
Drowning incidents	⬭	⬭

Mood items

During your LAST SHIFT, to what extent have you felt:

- As though you were in a positive mood

Very slightly or not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1	2	3	4	5

- As though you were in a negative mood

Very slightly or not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1	2	3	4	5

- Stressed

Very slightly or not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1	2	3	4	5

Coping strategies

During your LAST SHIFT, to what extent did you use the following strategies to help cope with any challenges or stressors :

	1	2	3	4
I took action to try to make the situation better	1	2	3	4
I tried to find comfort in my religion or spiritual beliefs	1	2	3	4
I tried to get advice or help from other people about what to do	1	2	3	4
I looked for something good in what is happening	1	2	3	4
I gave up the attempt to cope	1	2	3	4
I blamed myself for things that happened	1	2	3	4
I criticized myself	1	2	3	4
I did something to think about it less, such as watching tv, playing computer games, reading, daydreaming, sleeping,	1	2	3	4

1 = I haven't been doing this at all, **2** = I've been doing this a little bit, **3** = I've been doing this a medium amount, **4** = I've been doing this a lot

Final Page of Questionnaire

That is the end of the questions and the end of the study. Thank you very much for participating in this research. Your time is greatly appreciated.

If taking part in this study has caused you any distress, below are the contact details for some helplines.

Psychological Unit Services in SRCA

Website: (srca.org.sa)

Email: helpdesk@srca.org.sa

Tel: 00966112805555

Eradah (Al Amal) Mental Health Complex

Website: http://www.eradah.med.sa/

Email: eradah@eradah.med.sa

Tel: 00966114804548

If you have any questions about this survey or research project, please contact the Primary Researcher, Khalid Alshahrani: ml17kma@leeds.ac.uk

Furthermore, if you wish to withdraw your responses, you may do so within 1 month of completing the questionnaires, just email Khalid with your unique participant code requesting the withdrawal of your data.