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From Frontline to Mindline: An Umbrella Review of Systematic Reviews on First Responders Mental Health

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Abstract

Objective: Over the last decade a large body of research has been conducted into the mental health of first responders. Much of the literature has been synthesized into systematic reviews. Given this large number of articles, it is unclear whether any gaps remain in the knowledge of this topic. The aim of this umbrella review was to reveal any potential gaps.

Method: A systematic review in PsycInfo, Scopus, Pubmed, and the Cochrane database for systematic reviews revealed 78 systematic reviews eligible for inclusion. **Results:** The results show that most systematic reviews into the mental health of first responders are prevalence studies, interventions are less studied. Most of the studies are conducted in the Americas, followed by Europe and the Western Pacific. Police are the best studied group, followed by EMS and firefighters. The evidence on gender and age differences is inconclusive, though female first responders seem more susceptible to mental health problems. PTSD is the most studied mental health disorder. No clear intervention preference emerges from the literature, neither for treatment nor prevention. **Conclusions:** Three major gaps emerged from the existing literature. The first is the lack of research into first responders working in NGOs, the second is a regional bias in the literature with a gap in the research into developing countries, the third is a lack of focus on the prevention and treatment of mental health disorders.

Keywords: First responders, police, firefighters, emergency medical personnel, disaster responders, mental health, PTSD, depression, review

From Frontline to Mindline: An Umbrella Review of Systematic Reviews on First Responders Mental Health protocol

As a crisis situation unfolds, many civilians have a luxury position in that they can run away from the crisis. In running away, they are able to protect themselves from the worst of it. One particular group of people have chosen to make it their job to run towards crises and disaster. This group of first responders consist of a large number of individual employments, such as police officers, firefighters, emergency medical services (EMS) and non-governmental organisations (NGOs). One example of such a disaster is the 9/11 terrorist attack. Over 90.000 first responders are reported to have worked at the disaster site, over 400 of whom died there (Smith et al., 2019). In the aftermath of the disaster, the surviving first responders not only showed signs of increased physical injury, but mental injury too (Smith et al., 2019; Neria et al., 2011). Without assessing and reporting on the mental health of the 9/11 first responders, the increase in mental injury may not have been as noticeable as it is through adequate research.

The 9/11 attacks are an extreme example of a crisis situation that first responders work with. Many first responders deal with a wide array of high-stress situations at work, be it a response to violence for police, forest fires for firefighters, or a medical emergency for EMS personnel. Each of the individual crisis that a first responder responds to has the potential to leave a scar on the mental well-being of that person. Fortunately, there is a growing recognition that there is a need for research in the field of mental health in first responders. As a result of this growing recognition, many case and cohort studies have been reported on, as well as randomized controlled trials concerning interventions for this particular group. These studies have in turn been synthesized into a large number of systematic reviews and meta-analysis over the past decades. Currently, what is missing in the available research reports is a clear and concise overview of which first responder groups have been studied,

which mental health concerns arise from the previous literature, what are potentially effective interventions for first responders, and most importantly, where are the gaps in the current literature. Haugen et al. (2017) already stated that a large focus exists on military personnel in regard to mental health research. This may lead to bias in the overall reporting of RCTs and systematic reviews concerning first responder mental health care, as there may be cultural and functional differences between the different groups of first responders. A gap in populations studied in particular makes further conclusions on first responder mental health difficult and potentially impossible.

Creating a large overview of all current research on the topic of first responder mental health may help expose gaps in our knowledge and could inform future research in this field.

The current study

The aim of this systematic umbrella review of all previous systematic reviews in the field of mental health of first responders is to answer the question what the knowledge gaps are in systematic reviews concerning the mental health of first responders. The following sub questions will be addressed in answering the main question.

1. How are mental health issues addressed differently across various first responder roles (e.g., police, firefighters, humanitarian workers) in systematic reviews, and which mental health disorders are studied most?
2. Is there a regional bias in the systematic reviews on the mental health of first responders?
3. Which first responder groups are most commonly studied, and which are underrepresented in the systematic reviews?
4. Are there specific mental health challenges that are unique to certain first responder roles or regions that are not addressed in existing systematic reviews?

5. How do the systematic reviews address gender differences in the mental health of first responders?
6. Are there any age-related differences or trends in the mental health of first responders as presented in systematic reviews?
7. What interventions are commonly suggested in systematic reviews for improving the mental health of first responders?
8. How do systematic reviews address preventive measures for mental health challenges faced by first responders?
9. What is the prevalence of digital tools for MHPSS in the systematic reviews and how are they evaluated for their effectiveness?

Method

Eligibility

Inclusion criteria.

Type of participants. The review will include reviews that report on the mental health of first responders. First responders are defined as individuals whose job is being first on the scene of an emergency, such as police officers, firefighters, or paramedics.

Context / setting. The review will include reviews that focus on first responders that experienced at least one call out to an emergency location.

Type of studies. The review will include systematic reviews and meta-analysis of both quantitative and qualitative empirical studies that examine the mental health of first responders.

Types of publication. All systematic reviews and meta-analysis that were published in peer-reviewed journals will be included.

Exclusion criteria.

Type of participants. The review will exclude studies that focus solely on military personnel.

Type of studies. Non-systematic reviews such as literature reviews or narrative reviews are excluded from the umbrella review.

Types of publication. Reviews published in journals that are not peer-reviewed are excluded.

Search strategy

The databases to be searched will be PsycInfo, Scopus, Pubmed, and the Cochrane database for systematic reviews. An additional manual search will be conducted on the references of key systematic reviews to determine whether additional systematic reviews can be located. We aim to identify all systematic reviews on the topic of first responder mental health published before the date of 01-10-2023. The main search terms are “First responder”, “mental health” and “review”. The complete list of search terms can be found in appendix 1.

Selection processes

Based on a review of the title, abstract and key words, potential eligible references will be stored to an endnote library. Duplicates will be removed from the library afterwards. For the remainder of the references, full texts will be reviewed to determine final eligibility, taking into consideration the above criteria.

Data extraction

The information in the articles will be extracted using a table with the following headings:

Article		Type of First responder		Individual details		Mental health details				Influencing factors	Findings
Author /year	#	organisation	Geographical location	Gender	Age	MH Disorder / concern	Coping Strategy	Prevention	Intervention		

The column author/year will give the last name of the first author of the systematic review and the year of publishing. The column named # tells how many articles are included in the

systematic review. Under type of first responder details on which profession is studied are given, e.g. police or firefighters. The geographical location details in which WHO global region the original articles summarized in the systematic review are originated. Gender will give the percentage of males studied in the original articles if detailed in the systematic review. Age will give the range of average ages in the original articles. Under mental health details the topic of interest of the systematic review is detailed. MH disorder / concern will give details potential psychological disorders or well-being indicators. If coping strategies, prevention techniques or interventions are of interest in the systematic review, their details can be found in each corresponding column. Additional influencing factors for the mental health of first responders, that do not correspond well with each of the previous columns can be found under the column influencing factors. The articles main findings are detailed in the findings column.

Data synthesis

Statistical synthesis is not feasible given the wide variety of research considered for this umbrella review. Therefore, a narrative review will be most appropriate for answering the overarching questions.

Ethical approval

Due to the study design, no ethical approval from the department ethics committee was needed. Therefore, none was sought.

Results

To my best knowledge, this is the first umbrella review that addresses all categories of first responder occupations in relation to mental health. The findings will be presented using the questions mentioned in the introduction as themes. Starting with general study characteristics of the systematic reviews included in the umbrella review. The included themes are which and how mental health disorders are studied for first responders, potential

regional biases, over- and underrepresented first responder groups, unique mental health challenges for first responders, age and gender differences, interventions and preventative measures, and potential digital tools for MHPSS.

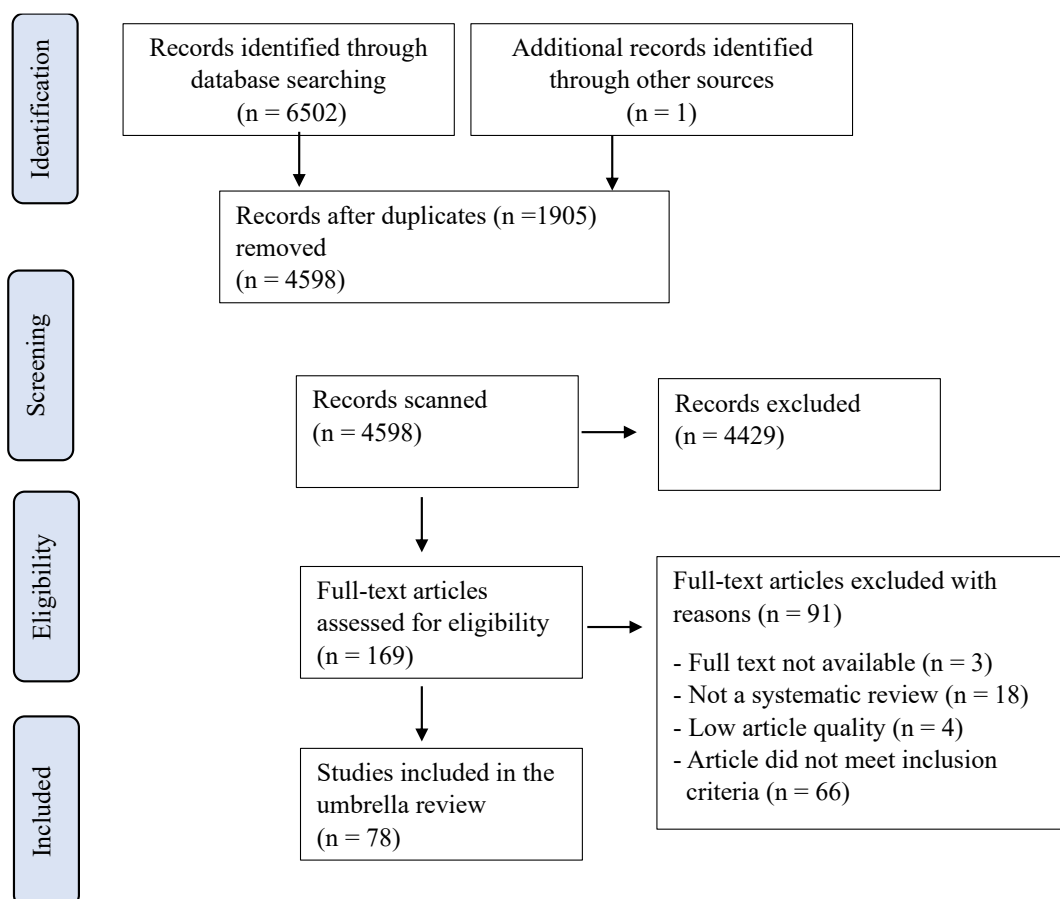
Study characteristics

The database search resulted in 6502 articles for review, one additional article was identified through reference list screening. After removing duplicates, the remaining 4598 articles were screened on their titles and abstracts. This screening excluded 4429 articles, leaving 169 articles eligible for full-text screening. 3 articles were excluded at this stage because no full text was available. 18 articles did not fit the PRISMA criteria for systematic review (Moher et al., 2009). Another 4 articles were excluded because they were deemed to be of low quality. The 66 articles excluded for not meeting the inclusion criteria either did not focus mainly on first responders, many had a focus on military personnel. Another exclusion reason was that the outcome measures were not focused on mental health problems. Physical problems were one of the main subjects that were excluded at this stage. A total of 78 articles were included in the final umbrella review. Three of the included articles were published before 2010 (Hem et al., 2001; Loo, 2003; Sterud et al., 2006), six articles were published between 2010 and 2015 (Berger et al., 2012; S. K. Brooks et al., 2015; Haugen et al., 2012; Neria et al., 2011; Webster, 2013; Wilson, 2015), nineteen articles were published between 2016 and 2019 (Aguayo et al., 2017; S. K. Brooks et al., 2016; Garbarino et al., 2019; Greinacher et al., 2019; Guilaran et al., 2018; Haugen et al., 2017; Janssens et al., 2018; Jones, 2017; Lees et al., 2019; Marshall et al., 2017; Petrie et al., 2018; Purba & Demou, 2019; Regehr et al., 2019; Sherwood et al., 2019; Smith et al., 2019; Stanley et al., 2016; Verbeek & Van Der Velden, 2016; Violanti et al., 2019; Wagner et al., 2019), fourteen were published in 2020 (Agrawal & Singh, 2020; Alden et al., 2020; Geuzinge et al., 2020; Lawn

et al., 2020; Laureys & Easton, 2020; Opie et al., 2020; Reardon et al., 2020; Sahebi et al., 2020; Syed et al., 2020; Wagner, White, Fyfe, et al., 2020; Wagner, White, Randall, et al.,

Figure 1.

PRISMA Diagram



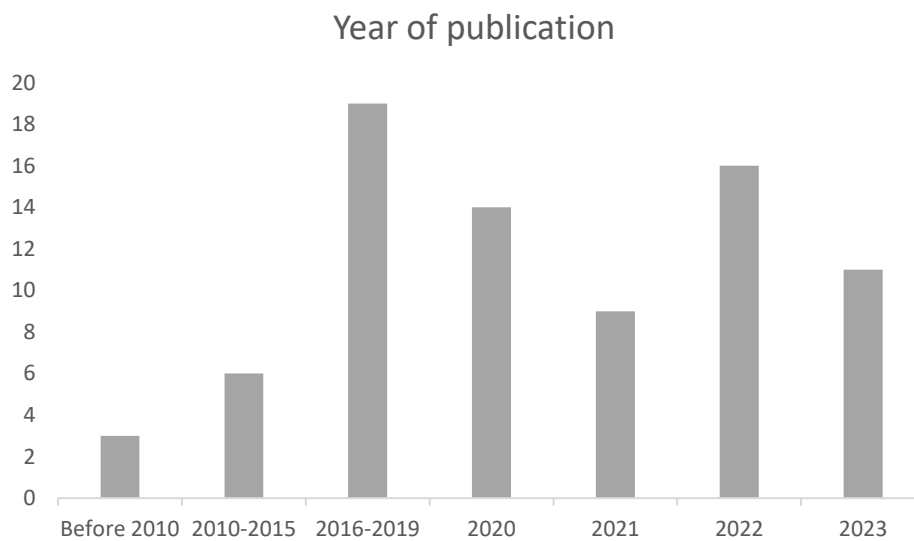
2020;

Wagner, White, Regehr, et al., 2020; Wild et al., 2020; Winders et al., 2020), nine were published in 2021 (D. Brooks & Brooks, 2021; Di Nota, Bahji, et al., 2021; Di Nota, Kasurak, et al., 2021; Doody et al., 2021; Edgelow et al., 2021; Galanis et al., 2021; Igboanugo et al., 2021; Kyron et al., 2021; Sahebi et al., 2021), sixteen were published in 2022 (Acquadro Maran et al., 2022; Alshahrani et al., 2022; Auth et al., 2022; Bevan et al., 2022; Claringbold et al., 2022; Díaz-Tamayo et al., 2022; Du et al., 2022; Huang, Chu, et al., 2022; Huang, Lee, et al., 2022; Krishnan et al., 2022; Morris et al., 2022; Sawyer et al., 2022; Serrano-Ibáñez et al., 2022; Sørensen et al., 2022; Thielmann et al., 2022; Wesemann et al., 2022), and eleven were published in 2023 (L. J. C. Alves et al., 2023; S. B. Alves et al., 2023;

Casas & Kegel, 2023; Dautovich et al., 2023; Diggin et al., 2023; Garmon-Jones et al., 2023; Hoell et al., 2023; Khoshakhlagh et al., 2023; Lu & Petersen, 2023; Vadvilavičius et al., 2023; Withrow et al., 2023). The individual study characteristics can be found in appendix B table 1. The main findings of the systematic reviews are summarized in appendix B table 2.

Figure 2

Systematic review year of publication



Question 1: How are mental health issues addressed differently across various first responder roles (e.g., police, firefighters, humanitarian workers) in systematic reviews?

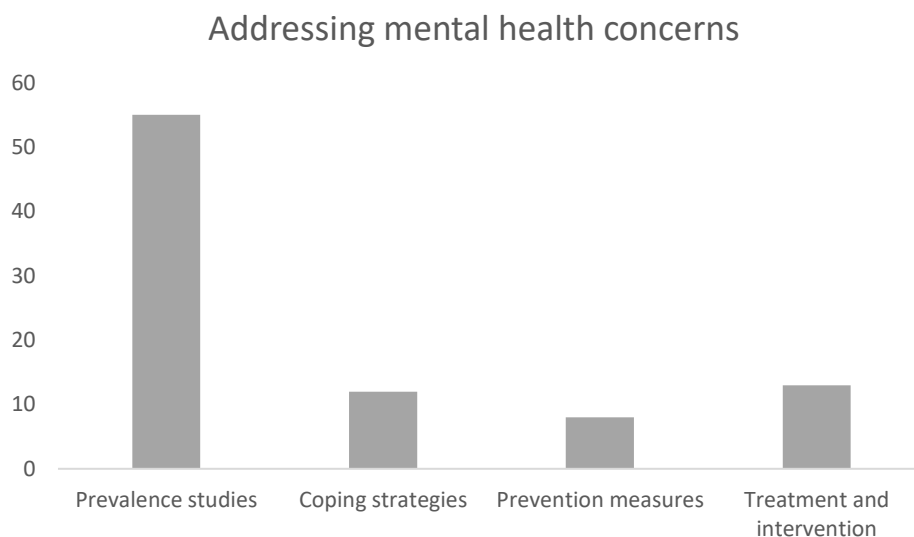
Most systematic reviews report on the prevalence of a variety of mental health concerns, with or without reporting on associated influencing sociodemographic, organisational, or individual risk factors. (n = 55). Coping strategies have been reported on by 12 systematic reviews, either in addition to other influencing factors or as the main focus of the review (L. J. C. Alves et al., 2023; D. Brooks & Brooks, 2021; S. K. Brooks et al., 2016; Dautovich et al., 2023; Di Nota, Kasurak, et al., 2021; Díaz-Tamayo et al., 2022; Diggin et al., 2023; Galanis et al., 2021; Garmon-Jones et al., 2023; Serrano-Ibáñez et al., 2022; Sherwood et al., 2019; Webster, 2013).

Eight systematic reviews reported on the effects of possible prevention measures and programs to prevent mental health disturbances and / or disorders (Auth et al., 2022; Bevan et al., 2022; S. K. Brooks et al., 2016; Di Nota, Bahji, et al., 2021; Doody et al., 2021; Opie et al., 2020; Stanley et al., 2016; Winders et al., 2020). Thirteen out of 78 systematic reviews studied the effectiveness of a variety of treatments and interventions for mental health disorders in first responders. (Alden et al., 2020; Alshahrani et al., 2022; S. B. Alves et al., 2023; Claringbold et al., 2022; Edgelow et al., 2021; Haugen et al., 2012; Lu & Petersen, 2023; Morris et al., 2022; Stanley et al., 2016; Vadvilavičius et al., 2023; Wild et al., 2020; Winders et al., 2020; Withrow et al., 2023)

No clear differences emerged from the literature regarding how mental health disorders are studied among the different first responder groups. The groups seem well distributed among the solely prevalence studies and the prevention and intervention studies.

Figure 3

How mental health concerns are addressed in the systematic reviews



Question 1a: Over- and underrepresented mental health disorders

The defined mental health disorders mentioned by the systematic reviews mostly correspond to psychological disorders as defined by the DSM-5 (American Psychiatric

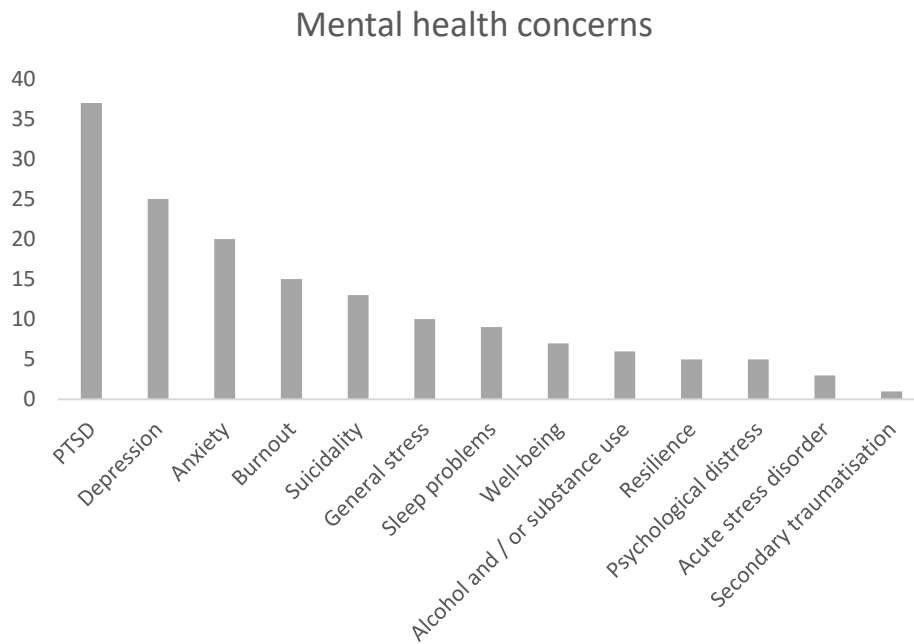
Association, 2013), in addition to positively framed mental health concern such as resilience and well-being.

The most studied mental health disorder in the systematic reviews is posttraumatic stress disorder (PTSD; $n = 37$; Acquadro Maran et al., 2022; Alden et al., 2020; Alshahrani et al., 2022; Berger et al., 2011; D. Brooks & Brooks, 2021; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Díaz-Tamayo et al., 2022; Guilaran et al., 2018; Haugen et al., 2012, 2017; Hoell et al., 2023; Janssens et al., 2018; Jones, 2017; Kyron et al., 2021; Lees et al., 2019; Marshall et al., 2017; Morris et al., 2022; Neria et al., 2011; Petrie et al., 2018; Regehr et al., 2019; Sahebi et al., 2020; Sawyer et al., 2022; Serrano-Ibáñez et al., 2022; Sherwood et al., 2019; Smith et al., 2019; Sørensen et al., 2022; Sterud et al., 2006; Syed et al., 2020; Verbeek & Van Der Velden, 2016; Wagner, White, Fyfe, et al., 2020; Wagner, White, Randall, et al., 2020; Wagner, White, Regehr, et al., 2020; Wesemann et al., 2022; Wilson, 2015; Winders et al., 2020), followed by depression ($n = 25$; Acquadro Maran et al., 2022; Agrawal & Singh, 2020; Alshahrani et al., 2022; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Haugen et al., 2017; Huang, Chu, et al., 2022; Igboanugo et al., 2021; Jones, 2017; Kyron et al., 2021; Lu & Petersen, 2023; Petrie et al., 2018; Purba & Demou, 2019; Regehr et al., 2019; Sawyer et al., 2022; Sherwood et al., 2019; Sterud et al., 2006; Syed et al., 2020; Wagner et al., 2019; Wagner, White, Randall, et al., 2020; Wagner, White, Regehr, et al., 2020; Wesemann et al., 2022; Winders et al., 2020; Withrow et al., 2023) and anxiety ($n = 20$; Alshahrani et al., 2022; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Guilaran et al., 2018; Huang, Chu, et al., 2022; Lees et al., 2019; Lu & Petersen, 2023; Purba & Demou, 2019; Regehr et al., 2019; Sawyer et al., 2022; Sherwood et al., 2019; Sterud et al., 2006; Syed et al., 2020; Wagner et al., 2019; Wagner, White, Randall, et al., 2020; Wagner, White, Regehr, et al., 2020; Wesemann et al., 2022; Winders et al., 2020; Withrow et al., 2023). Burnout is studied in

fifteen reviews (Aguayo et al., 2017; Alshahrani et al., 2022; L. J. C. Alves et al., 2023; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Diggin et al., 2023; Igboanugo et al., 2021; Purba & Demou, 2019; Reardon et al., 2020; Sahebi et al., 2021; Sawyer et al., 2022; Sherwood et al., 2019; Sterud et al., 2006; Withrow et al., 2023), suicidality in thirteen (Acquadro Maran et al., 2022; Di Nota, Bahji, et al., 2021; Hem et al., 2001; Igboanugo et al., 2021; Jones, 2017; Krishnan et al., 2022; Kyron et al., 2021; Loo, 2003; Purba & Demou, 2019; Sawyer et al., 2022; Stanley et al., 2016; Syed et al., 2020; Violanti et al., 2019) and general stress in ten (Alshahrani et al., 2022; Claringbold et al., 2022; Edgelow et al., 2021; Galanis et al., 2021; Huang, Chu, et al., 2022; Lu & Petersen, 2023; Sawyer et al., 2022; Thielmann et al., 2022; Vadvilavičius et al., 2023; Webster, 2013). Less studied are sleep problems (n = 9; S. B. Alves et al., 2023; Garbarino et al., 2019; Huang, Lee, et al., 2022; Igboanugo et al., 2021; Jones, 2017; Khoshakhlagh et al., 2023; Kyron et al., 2021; Lees et al., 2019; Withrow et al., 2023), well-being (n = 7; Bevan et al., 2022; S. K. Brooks et al., 2015, 2016; Claringbold et al., 2022; Lawn et al., 2020; Thielmann et al., 2022; Wild et al., 2020), alcohol and / or substance use (n = 6; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Haugen et al., 2017; Igboanugo et al., 2021; Jones, 2017; Syed et al., 2020), resilience (n = 5; S. K. Brooks et al., 2015; Doody et al., 2021; Laureys & Easton, 2020; Lu & Petersen, 2023; Wild et al., 2020), psychological distress (n = 5; Claringbold et al., 2022; Dautovich et al., 2023; Guilaran et al., 2018; Petrie et al., 2018; Purba & Demou, 2019), acute stress disorder (n = 3; Alden et al., 2020; Regehr et al., 2019; Wesemann et al., 2022), and secondary traumatisation (n = 1; Greinacher et al., 2019).

Figure 4

Mental health concerns addressed in the systematic reviews

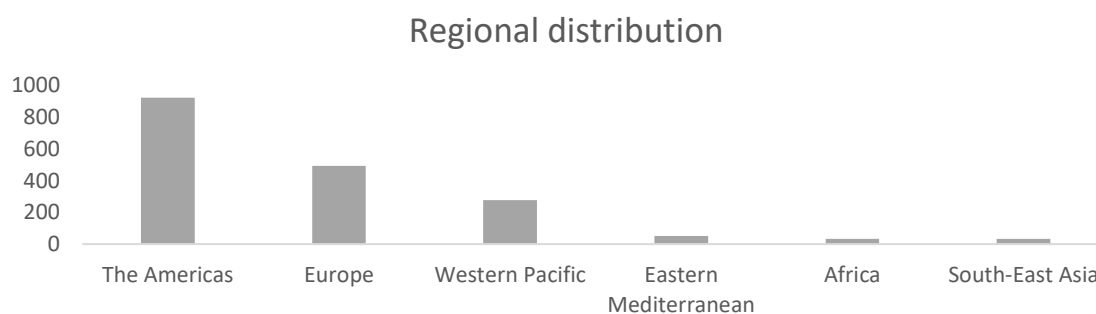


Question 2: Regional biases

The WHO grouped their member states into six regions, Americas, Europe, Africa, Eastern Mediterranean, South-East Asia and Western Pacific (WHO Regions, n.d.). This regional grouping was used to classify the geographical location of the primary sources in the systematic review. 67 articles either reported on the regional location studied or offered supplementary material where this information could be extracted. 922 original studies were conducted in the Americas, 492 in Europe, 278 in the Western Pacific, 51 in the Eastern Mediterranean, 34 in Africa and 33 in South-East Asia.

Figure 5

Regional distribution of original studies



Question 3: Over- and underrepresented first responder groups.

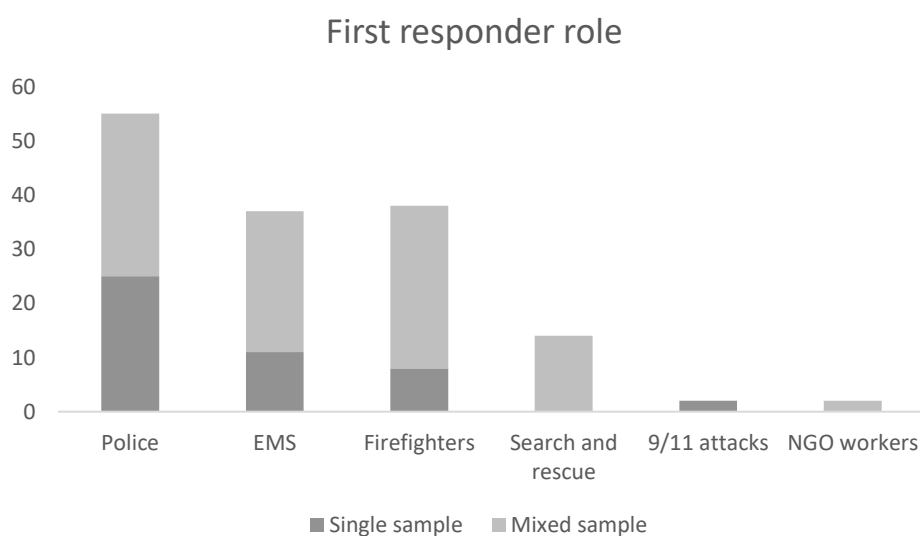
Most systematic reviews studied mixed samples of first responders (n = 32; Alden et al., 2020; Alshahrani et al., 2022; Auth et al., 2022; Berger et al., 2011; Bevan et al., 2022; S. K. Brooks et al., 2015, 2016; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Di Nota, Kasurak, et al., 2021; Díaz-Tamayo et al., 2022; Diggin et al., 2023; Doody et al., 2021; Edgelow et al., 2021; Geuzinge et al., 2020; Greinacher et al., 2019; Guilaran et al., 2018; Haugen et al., 2012, 2017; Huang, Chu, et al., 2022; Huang, Lee, et al., 2022; Jones, 2017; Kyron et al., 2021; Marshall et al., 2017; Morris et al., 2022; Opie et al., 2020; Stanley et al., 2016; Wesemann et al., 2022; Wild et al., 2020; Wilson, 2015; Winders et al., 2020). 25 systematic reviews focused solely on police personnel (Acquadro Maran et al., 2022; Agrawal & Singh, 2020; Aguayo et al., 2017; L. J. C. Alves et al., 2023; Casas & Kegel, 2023; Galanis et al., 2021; Garbarino et al., 2019; Hem et al., 2001; Janssens et al., 2018; Krishnan et al., 2022; Lees et al., 2019; Loo, 2003; Lu & Petersen, 2023; Purba & Demou, 2019; Regehr et al., 2019; Sherwood et al., 2019; Sørensen et al., 2022; Syed et al., 2020; Vadvilavičius et al., 2023; Verbeek & Van Der Velden, 2016; Violanti et al., 2019; Wagner et al., 2019; Wagner, White, Fyfe, et al., 2020; Webster, 2013; Withrow et al., 2023), eleven on emergency medical services (D. Brooks & Brooks, 2021; Du et al., 2022; Hoell et al., 2023; Lawn et al., 2020; Petrie et al., 2018; Reardon et al., 2020; Sahebi et al., 2021; Sawyer et al., 2022; Sterud et al., 2006; Thielmann et al., 2022; Wagner, White, Regehr, et al., 2020) and eight on firefighters (S. B. Alves et al., 2023; Garmon-Jones et al., 2023; Igboanugo et al., 2021; Khoshakhlagh et al., 2023; Laureys & Easton, 2020; Sahebi et al., 2020; Serrano-Ibáñez et al., 2022; Wagner, White, Randall, et al., 2020). 2 systematic reviews specifically focused on first responders who worked the 9/11 terrorist attack (Neria et al., 2011; Smith et al., 2019), humanitarian relief workers were the focus of one systematic review by S. K. Brooks et al. (2015).

When further detailing the first responder groups that were studied in mixed samples, a total of 55 studies reported on police mental health (Acquadro Maran et al., 2022; Agrawal & Singh, 2020; Aguayo et al., 2017; Alden et al., 2020; Alshahrani et al., 2022; L. J. C. Alves et al., 2023; Auth et al., 2022; Berger et al., 2011; Bevan et al., 2022; S. K. Brooks et al., 2015, 2016; Casas & Kegel, 2023; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Di Nota, Kasurak, et al., 2021; Diggin et al., 2023; Doody et al., 2021; Edgelow et al., 2021; Galanis et al., 2021; Garbarino et al., 2019; Geuzinge et al., 2020; Greinacher et al., 2019; Guilaran et al., 2018; Haugen et al., 2012; Haugen et al., 2017; Hem et al., 2001; Huang, Chu, et al., 2022; Huang, Lee, et al., 2022; Janssens et al., 2018; Krishnan et al., 2022; Kyron et al., 2021; Lees et al., 2019; Loo, 2003; Lu & Petersen, 2023; Marshall et al., 2017; Morris et al., 2022; Opie et al., 2020; Purba & Demou, 2019; Regehr et al., 2019; Sherwood et al., 2019; Sørensen et al., 2022; Stanley et al., 2016; Syed et al., 2020; Vadvilavičius et al., 2023; Verbeek & Van Der Velden, 2016; Violanti et al., 2019; Wagner et al., 2019; Wagner, White, Fyfe, et al., 2020; Webster, 2013; Wesemann et al., 2022; Wild et al., 2020; Wilson, 2015; Winders et al., 2020; Withrow et al., 2023), 38 on firefighters (Alden et al., 2020; Alshahrani et al., 2022; S. B. Alves et al., 2023; Auth et al., 2022; Berger et al., 2011; Bevan et al., 2022; S. K. Brooks et al., 2015, 2016; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Di Nota, Kasurak, et al., 2021; Díaz-Tamayo et al., 2022; Diggin et al., 2023; Doody et al., 2021; Edgelow et al., 2021; Garmon-Jones et al., 2023; Geuzinge et al., 2020; Greinacher et al., 2019; Guilaran et al., 2018; Haugen et al., 2012; Huang, Lee, et al., 2022; Igboanugo et al., 2021; Jones, 2017; Khoshakhlagh et al., 2023; Kyron et al., 2021; Laureys & Easton, 2020; Marshall et al., 2017; Morris et al., 2022; Opie et al., 2020; Sahebi et al., 2020; Serrano-Ibáñez et al., 2022; Stanley et al., 2016; Wagner, White, Randall, et al., 2020; Wesemann et al., 2022; Wild et al., 2020; Wilson, 2015; Winders et al., 2020), and 37 on emergency medical services (Alden et al., 2020; Alshahrani

et al., 2022; Auth et al., 2022; Berger et al., 2011; Bevan et al., 2022; D. Brooks & Brooks, 2021; S. K. Brooks et al., 2015, 2016; Claringbold et al., 2022; Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Díaz-Tamayo et al., 2022; Diggin et al., 2023; Doody et al., 2021; Du et al., 2022; Edgelow et al., 2021; Geuzinge et al., 2020; Greinacher et al., 2019; Guilaran et al., 2018; Haugen et al., 2017; Hoell et al., 2023; Huang, Chu, et al., 2022; Huang, Lee, et al., 2022; Jones, 2017; Kyron et al., 2021; Lees et al., 2019; Petrie et al., 2018; Reardon et al., 2020; Sahebi et al., 2021; Sawyer et al., 2022; Stanley et al., 2016; Sterud et al., 2006; Thielmann et al., 2022; Wagner, White, Regehr, et al., 2020; Wesemann et al., 2022; Wilson, 2015; Winders et al., 2020). Search and Rescue workers were included in 14 studies, only using mixed sample studies (Berger et al., 2011; S. K. Brooks et al., 2015, 2016; Claringbold et al., 2022; Di Nota, Kasurak, et al., 2021; Díaz-Tamayo et al., 2022; Diggin et al., 2023; Doody et al., 2021; Greinacher et al., 2019; Guilaran et al., 2018; Haugen et al., 2017; Neria et al., 2011; Wesemann et al., 2022; Winders et al., 2020). NGO workers in general were included in a mixed sample by Wesemann et al., 2022. Winders et al. (2020) included Red Cross and Red Crescent in their mixed study population.

Figure 6

Distribution of occupations within the systematic reviews



Question 4: specific mental health challenges unique to certain first responder roles or regions

Stigma surrounding mental health problems consistently emerged from the literature as a cultural problem specific to first responders. According to Haugen et al. (2017), one in three first responders report experiencing mental health stigma. The stigma exists among all first responder occupations. Stigma in police culture is mentioned most often (Agrawal & Singh, 2020; Auth et al., 2022; Casas & Kegel, 2023; Haugen et al., 2017; Regehr et al., 2019; Wesemann et al., 2022), but it is also mentioned for EMS (Auth et al., 2022; Haugen et al., 2017; Lawn et al., 2020; Wesemann et al., 2022), firefighters (Auth et al., 2022; Wesemann et al., 2022) and NGOs (Wesemann et al., 2022). Mental health stigma has been linked with alcohol use disorder, depression and PTSD (Haugen et al. 2017).

No other specific mental health challenges emerged from the literature.

Question 5: Gender differences in mental health

29 out of 78 systematic reviews reported on the gender distribution in the included articles. 19 of the 29 reviews averaged the male participation in the articles at more than 75%. This may be due to men being overrepresented in the studied population, thus finding the same overrepresentation in the studied samples. This skew does make conclusions on gender difference more difficult.

The evidence on gender differences is inconclusive. Some systematic reviews found no clear associations between gender and burnout (L. J. C. Alves et al., 2023; Opie et al., 2020), poor sleep (Garbarino et al., 2019), depression (Huang, Chu, et al., 2022; Opie et al., 2020; Wagner et al., 2019), anxiety (Huang, Chu, et al., 2022.), PTSD (Opie et al., 2020; Sawyer et al., 2022), stress (Opie et al., 2020; Sawyer et al., 2022) and suicidality (Sawyer et al., 2022). On the other hand, some reviews found that there is an association between being female and higher probability of depression (Opie et al., 2020; Sawyer et al., 2022; Sherwood

et al., 2019; Thielmann et al., 2022; Violanti et al., 2019), PTSD (Opie et al., 2020; Lees et al., 2019; Regehr et al., 2019; Sherwood et al., 2019; Smith et al., 2019; Syed et al., 2020), burnout (Aguayo et al., 2017; Opie et al., 2020; Reardon et al., 2020), anxiety (Du et al., 2022; Sawyer et al., 2022), stress (Du et al., 2022), suicidality (Krishnan et al., 2022), secondary traumatisation (Greinacher et al., 2019). Wesemann et al. (2022) found that women in the emergency services are at higher risk for mental health problems in general.

Additionally, being male has been reported to be associated with higher rates of burnout (Sawyer et al., 2022, Thielmann et al., 2022), alcohol misuse (Thielmann et al., 2022) and stress (Galanis et al., 2021)

Question 6: Age-related differences or trends in mental health

Nineteen out of 78 systematic reviews reported on the age distribution in the original articles, with the most common average age being between 30-40 years old.

The evidence for the association between age and mental health concerns is mixed. Some found that age has no significant association with burnout (L. J. C. Alves et al., 2023; Opie et al., 2020), poor sleep (Garbarino et al., 2019; Khoshakhlagh et al., 2023), PTSD (Opie et al., 2020), depression (Opie et al., 2020), anxiety (Opie et al., 2020), stress (Opie et al., 2020). According to some association exists between younger age and PTSD (Berger et al., 2011; Jones, 2017; Opie et al., 2020), anxiety (Opie et al., 2020), depression (Opie et al., 2020), burnout, and poorer well-being (S. K. Brooks et al., 2015). Others found an association between older age and stress (Galanis et al., 2021) and PTSD (Opie et al., 2020; Wesemann et al., 2022). The association between older age and poorer mental health outcomes could be mediated by the years of service. According to Serrano-Ibáñez et al. (2022), Syed et al. (2020) and Wagner, White, Randall, et al. (2020), increased years of service is a risk factor for mental health problems.

Additionally, according to Alshahrani et al. (2022) a higher age is associated with better treatment outcomes for PTSD.

Question 7: Commonly suggested interventions

Thirteen out of 78 articles reported on the existence and / or effectiveness of psychological interventions (Alden et al., 2020; Alshahrani et al., 2022; S. B. Alves et al., 2023; Claringbold et al., 2022; Edgelow et al., 2021; Haugen et al., 2012; Lu & Petersen, 2023; Morris et al., 2022; Stanley et al., 2016; Vadvilavičius et al., 2023; Wild et al., 2020; Winders et al., 2020; Withrow et al., 2023).

The most commonly suggested interventions were cognitive behavioural therapy (Alden et al., 2020; Alshahrani et al., 2022; Haugen et al. 2012; Lu & Petersen, 2023; Winders et al., 2020), mindfulness (Claringbold et al., 2022; Lu & Petersen, 2023; Vadvilavičius et al., 2023; Winders et al., 2020, Withrow et al., 2023), debriefing (Alshahrani et al., 2022; Claringbold et al., 2022; Edgelow et al., 2021; Winders et al., 2020), eye movement desensitization and reprocessing (Alden et al., 2020; Alshahrani et al., 2022; Haugen et al., 2012, Morris et al., 2022), resilience training (Alshahrani et al., 2022; Claringbold et al., 2022; Edgelow et al., 2021), and brief eclectic psychotherapy (Alden et al., 2020; Alshahrani et al., 2022; Haugen et al., 2012). All mentioned interventions can be found in Appendix B table 1. Most mentioned interventions were found to be effective in reducing mental health problems and / or increasing well-being. The evidence on the effectiveness of debriefing is mixed. According to Claringbold et al. (2022) debriefing is an effective intervention, whereas Wild et al. (2020) and Winders et al. (2020) did not find debriefing to be effective.

Question 8: Preventative measures

Eight out of 78 systematic reviews reported on the effects of possible prevention measures and programs to prevent mental health disturbances and / or disorders (Auth et al.,

2022; Bevan et al., 2022; S. K. Brooks et al., 2016; Di Nota, Bahji, et al., 2021; Doody et al., 2021; Opie et al., 2020; Stanley et al., 2016; Winders et al., 2020).

Prevention of mental health problems can be roughly categorized in three groups. The first is pre-employment and pre-deployment psychological screening (Opie et al. 2020). According to Opie et al. (2020) the variables on which this pre-deployment screening should be based is still weak. The second group is prevention through organisational and informal sources of support (Auth et al., 2022; Bevan et al., 2022; S. K. Brooks et al., 2016). According to Bevan et al. (2021) social support and good working relations are potential buffers to professional stressors. The final prevention method is a variety of intervention strategies with the focus on preventing mental health problems (Di Nota, Bahji, et al., 2021; Doody et al., 2021; Stanley et al., 2016; Winders et al., 2020). These interventions ranged from mindfulness (Di Nota, Bahji, et al., 2021) and stress management (Doody et al., 2021), to a suicide prevention programme (Stanley et al., 2016). The evidence for the effectiveness of pre-deployment stress management training is weak (Doody et al., 2021), the suicide intervention “Together for life” is effective in decreasing suicide rates in first responders (Stanley et al., 2016).

Question 9: digital tools for MHPSS

No digital tools for mental health and social support emerged from the literature. Di Nota, Bahji, et al. (2021) commented the limitations of general digital mental health treatment tools. The limitations that emerged were poor participant adherence and completion (Di Nota, Bahji, et al., 2021).

Discussion

This umbrella review revealed that most of the reviewed papers focused on the prevalence of mental health disorders with or without influencing factors. One potential explanation for this finding is monetary restraints. A cohort study using self-report measures

is cheaper to conduct than a randomized controlled trial studying the effectiveness of prevention and intervention measures. Finding willing participants may also be easier in a one-time digital self-report study, compared to the time investment it takes to undergo a specific treatment with follow-up outcome measurements.

The mental health disorders PTSD, depression and anxiety are the most often studied in the systematic reviews, with PTSD being most studied, followed by depression and then anxiety, this finding is in line with Wagner, White, Randall, et al. (2020), who found that of the three, anxiety is the least studied. Various systematic reviews conclude that the prevalence of these disorders is higher when compared to the general population (Berger et al., 2011; Hoell et al., 2023; Huang, Chu, et al., 2022; Jones, 2017; Petrie et al., 2018; Sahebi et al., 2020; Smith et al., 2019; Sterud et al., 2006; Syed et al., 2020; Wesemann et al., 2022). Interestingly, when alcohol use is mentioned, it is often as a risk factor for other mental health disorders (Dautovich et al., 2023; Di Nota, Bahji, et al., 2021; Lawn et al., 2020), the prevalence of problematic alcohol use is much less studied as an individual mental health concern. An explanation may be that alcohol use is culturally accepted among first responders (Jones, 2017).

The current study revealed that most research is still conducted in Western, educated, industrialized, rich and democratic (WEIRD) countries. In 2008 it was revealed that 96% of participants studied in psychology fit within the WEIRD population, whilst they only represented 12% of the world population (Henrich et al., 2010). The lack of progress in this area points towards the persistency of both imbalances in research resources and the psychological search for absolute generalisability for all humans (Arnett, 2008), the latter being difficult to accomplish when including the wide variety of additional population variables that come with non-WEIRD populations.

A positive development in the research into first responder mental health is the inclusion of more occupations within the research. Jones (2017) mentioned that whilst police was well studied, firefighters and EMS were at that time understudied populations. Between 2017 and 2023 this gap seems to be corrected. Police remains to be the most studied first responder population, both firefighters and EMS have been increasingly represented in the research into first responder mental health. The group still left out are those working in humanitarian organisations.

In the prevalence studies, many influencing factors were investigated in their relation to first responder mental health. While some occupational factors, such as shift work, have been linked to poorer mental health outcomes (Bevan et al., 2022; Garbarino et al., 2019; Lees et al., 2019). However, the most persistent mental health challenge specific to first responders is mental health stigma. This stigma is ingrained in the culture of many first responder occupations (Auth et al., 2022; Wesemann et al., 2022). The existing stigma can be explained by multiple factors. Firstly, first responder occupations have been, and still are, a male dominated field. Help seeking behaviours may be hindered by the machismo in male dominated occupations. Another explanation are the potential consequences of admitting to dealing with mental health issues. Haugen et al. (2017) found that a fear exists that mental health services are not confidential and seeking professional help can have negative consequences for the future career.

The current evidence on the influence of age and gender on mental health in first responders is inconclusive. The skewed gender distribution in the research, although possibly reflective of the gender distribution in the population, makes definite conclusions on gender differences difficult. As for age, there are difficulties detangling the effects of increasing age with the effects of longer service and a higher number of experienced traumatic events. Fortunately, neither age nor gender are revealed to be of major influence toward first

responder mental health. Therefore, although it is desirable to improve on the research in this area, it is not very likely that new research leads to major breakthroughs in this area.

As prevention and intervention are currently understudied, the only clear conclusions that can be drawn from the research is that treatments that are effective in the general population for specific mental health disorders, show effectiveness in first responders. The practice of debriefing after a traumatic incident is a common intervention implemented by first responder organisations. The research shows however, that this particular intervention, while not very costly, is not that effective in preventing mental health problems in first responders.

The primary aim of this umbrella review of systematic reviews was to summarize all existing literature on the mental health of first responders, in order to reveal potential gaps in the current knowledge. The literature reviewed consisted of a wide variety of first responder groups, mental health concerns, and risk – and protective factors.

The main finding of the review is the data on which first responder groups have been studied. The primary focus of the first responder mental health research has been on police officers. A fair amount of research has reported on the state of mental health of EMS and firefighters. All three aforementioned groups have had systematic reviews focus on only their group. The current literature is lacking in regard to the state of mental health of NGO workers. The umbrella term NGO has been mentioned only in Wesemann et al., 2022. The specific groups of Red Cross and Red Crescent have been mentioned by Winders et al. (2020). In both of these studies, the NGO workers' mental health has been synthesized within a larger mix of first responders. Other NGOs such as doctors without borders has not been mentioned in the existing systematic reviews.

Another important finding is the regional bias found in the current body of research. Over 50% of the original studies reported on in the systematic reviews were conducted in the

Americas, 27.2% in Europe and 15.4% in the western pacific. This leaves a very small percentage of research that is divided over Africa, South-East Asia and the Eastern Mediterranean. Taking this result in combination with the lack of research on NGOs, it seems there is hardly any data on the mental health implications of working in an emergency or crisis situation in developing countries. In 2017 Haugen et al. stated that barriers related to treatment seeking in military personnel may not generalise to first responder populations. This same statement can be made in regard to NGO / humanitarian workers. It is currently unclear, due to the lack of research, whether mental health related findings for first responders can be generalised to NGO / humanitarian workers. Additionally, it is unclear whether mental health findings for westernised first responders generalise to the rest of the globe. As of today, no definite conclusions can be drawn on the mental health prevalence, influencing factors, prevention and intervention for first responders either working in a non-westernised country as a temporary relief worker or first responders inhabiting the non-westernised countries.

The final major finding of this umbrella review is the way mental health disorders have been reported on in systematic reviews thus far. The majority of the research focusses on the prevalence of certain mental disorders and their risk and protective factors. Whilst this is important starting data, this topic almost seems overstudied at this point when it comes to police, EMS and firefighters. There is much less data on the prevention and treatment of mental health disorders in first responders. In the systematic reviews that do report on prevention and treatment usually combine many different treatments in one synthesis, making their conclusions broad. The general conclusions are that most treatments are effective. No systematic reviews compare one treatment option to another, revealing clear preference for one particular treatment. The same goes for prevention studies. It cannot be concluded

whether this gap exists solely in the systematic reviews or whether there is a clear gap in randomised controlled trials for mental health treatment for first responders.

Strengths and limitations

The main strength of this umbrella review is that it provides a clear and concise overview of the existing knowledge regarding first responder mental health in systematic reviews. This review can therefore be used as a starting point for future research regarding this topic.

The choice to only focus on systematic reviews to include in this umbrella is a limitation. It is possible that there have been more studies in the recent years on the topic of first responder mental health that have not been synthesized into existing systematic reviews. The knowledge of those potential studies can therefore not be reported on in this umbrella review. Given that the systematic reviews included in this umbrella reviews have mostly been published in the very recent history, the chance of missing major studies is small, however not impossible.

Recommendations for future research

Given that the aim of this umbrella review was to reveal potential gaps in the current research on first responder mental health, some clear recommendations for future research emerged from the review. The first recommendation is to study the prevalence of a variety of mental health problems in first responders that work for different NGOs. Additionally, potential risk and protective factors specific to this group should be analysed. The same recommendation should be made for first responders working in understudied regions. Given the clear lack of research conducted in developing countries, the prevalence of mental health problems in their first responders is unclear.

A second major recommendation is the need for more focused intervention and prevention studies. One place to start addressing prevention and intervention may be in

studying the effectiveness of destigmatisation programs within first responder organisations. As emerged from the literature, stigma is associated with both poorer mental health outcomes (Haugen et al., 2017) and treatment avoidance (Casas & Kegel, 2023). Whilst stigma already emerges from the systematic reviews as a topic of interest, more insight into the workings may be beneficial to researching treatment and prevention interventions for first responders.

Conclusions

Over the last decade there has been a small explosion of research on the mental health of first responders. The research has given answers to many questions regarding the prevalence of mental health problems in police, firefighters, and EMS. Some clear gaps do still exist in the current literature. The biggest gap is the lack of research into the mental health of first responders working for NGOs. Additional gaps are a clear regional bias and less research into the prevention and treatment of mental health problems. Fortunately, these emerging gaps also provide clear starting points for future research into the mental health of first responders, as this remains a topic of major interest when it comes to the overall health of those that provide help and care to others in need.

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Appendix A

Complete search terms.

Database search for mental health concerns .

("First responders" OR "Emergency responders" OR "Emergency personnel" OR "Emergency services" OR "Law enforcement officers" OR "police officers" OR "police personnel" OR paramedics OR "Emergency medical technicians" OR "emergency medical service" OR "Emergency medical personnel" OR firefighters OR "rescue personnel" OR "Humanitarian workers" OR EMT OR "Disaster workers" OR "Red cross" OR "Red crescent")

AND

("Mental health" OR "Behavioral health" OR "Behavioural health" OR "Emotional health" OR "psychological health" OR depression OR anxiety OR suicide OR "Posttraumatic stress responses" OR "posttraumatic stress disorder" OR burnout OR "Substance abuse" OR gambling OR "Sexual risk taking" OR "sleep disorders" OR alcoholism OR "drug abuse" OR addiction OR "Non-suicidal self-injury" OR NNSI OR "Self-injury" OR stress OR "Psychological stress" OR distress OR "Neurotic disorders" OR "Well-being" OR "emotional adjustment" OR "Social health" OR "Subjective well-being" OR "Quality of life" OR panic OR Guilt OR "Adjustment disorder" OR "reactive depression")

AND

("Systematic review" OR "meta-analysis")

Database search for interventions and treatments.

("First responders" OR "Emergency responders" OR "Emergency personnel" OR "Emergency services" OR "Law enforcement officers" OR "police officers" OR "police personnel" OR paramedics OR "Emergency medical technicians" OR "emergency medical

service” OR “Emergency medical personnel” OR firefighters OR “rescue personnel” OR
“Humanitarian workers” OR EMT OR “Disaster workers” OR “Red cross” OR “Red
crescent”)

AND

(“mental health services” OR assessment OR therapy OR psychotherapy Or counselling OR
intervention OR treatment OR “Social support” OR “Social groups” OR “mental health
programmes” OR “integrated services” OR “outreach programmes” OR “Mental health and
psychosocial support” OR MHPSS)

AND

(“Systematic review” OR “meta-analysis”)

Appendix B

Supplementary tables

Table 1: Study characteristics

Article information		First responder details		Individual characteristics		Mental health details				Influencing factors
Authors (year)	#	organisation	Geographical location	Gender	Age	MH Disorder / concern	Coping Strategy	Prevention	Intervention	
Acquadro Maran et al. (2022)	20	police	Europe N=9 Americas N=7 SE Asia N=2 Africa N=1 Western Pacific N=1	NR.	NR.	PTSD Depression Suicidality	-	-	-	- organizational social support
Agrawal and Singh (2020)	43	police	Americas N=26 Europe N=11 Western Pacific N=3 SE-Asia N=2 Africa N=1	79.4% Male	NR.	Depression	-	-	-	- Exposure to trauma - Proximity to violence - High empathy in females aggravates the impact of exposure to violence - stigma
Aguayo et al. (2017)	43	police	Americas N=14 Europe N=14 Western Pacific N=2 Africa N=1	NR.	NR.	Burnout - Emotional exhaustion - Depersonalisation - Reduced personal accomplishment	-	-	-	-
Alden et al. (2020)	21	Police Firefighters Ambulance personnel	Americas N=3 Europe N=6 Western Pacific N=1 SE-Asia N= 1 E Mediterranean N=1	NR.	NR.	PTSD Acute stress disorder	-	-	-EMDR -Trauma-focused CBT - Brief Eclectic Psychotherapy - Compassion-focused Therapy - Stress Management Programme -work leave	-
Alshahrani et al. (2022)	15	Police 6 Firefighters3 Ambulance2	Americas N=5 Europe N=4 Western Pacific N=3 E Mediterranean N=2 SE-Asia N=1	64.8% male	39.5	PTSD Anxiety Depression Stress Burnout	-	-	- CBT - Critical incident stress debriefing - Resilience training - EMDR - Brief eclectic psychotherapy	-

									<ul style="list-style-type: none"> - eclectic group counselling - written emotional expressing - mental agility and psychological strength 	
L. J. C. Alves et al. (2023)	41	police	Europe N=21 Americas N=13 Western Pacific N=4 SE-Asia N=2 Africa N=1	56-100% male	36.55 (sd=8.95)	Burnout	- maladaptive vs healthy coping	-	-	- work schedules
S. B. Alves et al. (2023)	7	firefighters	Americas N=5 Europe N=1 E Mediterranean N=1	In three trials male 96%	NR.	Sleep quality	-	-	<ul style="list-style-type: none"> - sleep education - medication 	-
Auth et al. (2022)	24	Police Ambulance personnel Firefighters	Europe N=14 Americas N=9 Africa N=1	Nd	NR.	General mental health problems	-	<ul style="list-style-type: none"> <i>organisational sources of support</i> - downtime period - genuine concern from supervisor - official peer support networks <i>Informal support</i> - colleagues and family - regular work partner - reassurance and validation 	-	<p><i>Help seeking factors:</i></p> <ul style="list-style-type: none"> - shared experiences with intervention provider - stigma as a help seeking barrier - shame - career concerns Confidentiality concerns Mental health literacy and emotional awareness
Berger et al. (2011)	29	Ambulance personnel Fire fighters Police officers Other rescue teams	NR.	NR.	NR.	PTSD	-	-	-	-
Bevan et al. (2022)	5	Firefighters Police	Europe N=1 Americas N=1	NR.	NR.	Professional wellbeing	-	Social support	-	- insufficient pay

		Ambulance personnel Medical personnel responding to crises Dispatcher for emergency calls	Western Pacific N=3					Good working relations		and limited organisational resources have also been reported as contributors to stress. -work schedules - physical discomfort - the community served by EFRs acted both as a motivator and social support factor, but also as an additional stressor
D. Brooks and Brooks (2021)	18	Ambulance personnel	NR.	NR.	NR.	PTSD	- Dwelling on memories - Emotion focussed coping -dysfunctional disclosure (avoidance or repeatedly disclosing) - alcohol use - smoking	-	-	- alexithymia - lower resilience - specific job details
S. K. Brooks et al. (2016)	111	Disaster relief workers (including police, fire-fighters, medics, search & rescue)	NR.	NR.	NR.	Psychological wellbeing	- avoidance coping - proactive coping - positive thinking	Social support Organisational / professional support	-	- Professional vs volunteer - length of employment - pre disaster training and information - individual life events as traumas and psychiatric history - traumatic exposure during disaster - longer duration on site -peri-traumatic distress / dissociation - role ambiguity - perception of safety, threat and risk - Harm to self or close others - personal life events
S. K. Brooks et al. (2015)	61	Humanitarian relief workers (including police, fire-fighters, medics, search & rescue)	NR.	NR.	NR.	Mental wellbeing risks and resilience	- Self-doubt and guilt - Negative coping strategies - Tobacco -Alcohol - Tranquilisers - Medication - Positive coping strategies	-	-	Pre-deployment: - Preparedness and training Peri-deployment: - Deployment length and timing - traumatic exposure - Becoming emotionally involved - leadership - social support - Formal during-disaster support - role clarity

							<ul style="list-style-type: none"> - Talking - Writing - Deep breathing -Returning to work - Finding meaning and purpose in life and work - Compart-mentalising things outside of control 				- Safety and equipment
Casas and Kegel (2023)	31	Law enforcement	Americas N= 14 Europe N=11 Africa N=3 Western Pacific N=1 SE-Asia N=1	NR.	NR.	Emotional, cognitive and behavioural difficulties related to mental health	-	-	-	-organisational stressors -stigma towards mental health - low mental health literacy	
Claringbold et al. (2022)	19	Police 7 Firefighters 5 Ambulance personnel 3 Rescue workers	Western Pacific N=19	NR.	NR.	PTSD Anxiety Stress Psychological distress Depression Burnout Well-being Anger	-	-	<ul style="list-style-type: none"> - Debriefing and employee assistance programmes 5 - mental health literacy programmes 4 - resilience building programme 2 - mindfulness 3 - supportive leadership behaviour training - social support meetings - chaplain services - physical activity programmes - emotional disclosure in writing 	-	
Dautovich et al. (2023)	17	Police 9 Firefighters 7 EMS 3	Europe N= 5 Americas N= 10 Western Pacific N= 2	Male 50.2-99.3 % Mdn= 85.6%	NR.	PTSD Depressive symptoms Anxiety Burnout General distress Drinking behaviours	Engaged coping behaviour Disengaged coping behaviour	-	-	-	
Di Nota, Bahji, et al. (2021)	42	Public safety personnel (including firefighters,	Americas N=19 Europe N=13 Western Pacific N=7 SE-Asia N=2 E Mediterranean N=1	NR.	NR.	Depression Burnout PTSD Anxiety Suicidality	-	- Mindfulness based resilience programme	-	-	

		police, Paramedics)				Substance use Absenteeism		- mindfulness based stress management - psycho-educational resilience promotopn - web-based stress management - web based mindfulness - psycho-physiological stress management - Stress management coping skill building - Web-based stress management coping skill building		
Di Nota, Kasurak, et al. (2021)	13	Firefighter 3 Police 9 Search and rescue 1	Americas N=4 Western Pacific N=4 Europe N=2 SE-Asia N=1 Africa N=1 E Mediterranean N=1	NR.	NR.	Psychological health	Approach coping Avoidant coping	-	-	-
Díaz-Tamayo et al. (2022)	31	Paramedics (2876) Firefighters (3012) Rescue-workers (161)	Europe N=12 Americas N=9 Western Pacific N=7 E Mediterranean N=2 Africa N=1	NR.	20-62	PTSD	Avoidance Disconnection Denial Substance use Acceptance Self-efficacy Emotional support	-	-	-
Diggin et al. (2023)	11	EMS Rescue workers Firefighters	Europe N=6 Americas N=5	NR.	NR.	Burnout	Problem focused generic - Proactive coping	-	-	-

		Police					<ul style="list-style-type: none"> - Problem-solving coping - Confrontive coping - Self-control - Humour Emotion based - Emotion-focused coping - Self-criticism - Self-blame - Social support - Religion Cognitive reappraisal - Reappraisal - Accepting responsibility - Looking forward to off duty Avoidance -Avoidance -Distraction - Distancing - Denial - Alcohol - Wishful thinking 			
Doody et al. (2021)	13	Police Firefighters Ambulance Rescue workers	Americas N=6 Europe N=4 SE Asia N=2 Western Pacific N=1	64.6% male	18-43	Resilience	-	Pre-deployment resilience building and stress management	-	-
Du et al. (2022)	25	EMS	Europe N=10 Americas N=6 Western Pacific N=6 E Mediterranean N=3	NR.	NR.	General mental health outcomes	-	-	-	<ul style="list-style-type: none"> - Adequate personal protective equipment - Adequate training - Preparedness - The covid pandemic - Concern about bringing home infections - concern about contraction and admission of infection - Staff shortages - not wanting to let patients down

Edgelow et al. (2021)	89	public safety personnel: -correctional officers, -emergency dispatchers, - firefighters 13 -paramedics - police officers 57	Europe N=26 Americas N=47 Western Pacific N=13 SE-Asia N=2 Africa N=1	75% male	NR.	Stress	-	-	Training programmes - group training Debriefing Resilience enhancing programmes	-
Galanis et al. (2021)	29	Police	Americas N= 13 Europe N= 10 Western Pacific N= 3 SE-Asia N= 3	NR.	NR.	Stress	Negative and maladaptive coping strategies	-	-	Risk factors: Age Marriage status Gender Negative work conditions - increased working hours, - shift work, - decreased job satisfaction - on-duty injuries -work-family conflict, -negative working environment, -patrol assignment, -burnout, -bureaucracy, - low salary Exposure to critical incidents Other operational factors Lifestyle factors Personality traits
Garbarino et al. (2019)	18	police	Americas N=14 Western Pacific N=2 SE-Asia N=1 E Mediterranean N=1	NR.	M age ≈ 30-40	Sleep quality	-	-	-	Shift work
Garmon-Jones et al. (2023)	10	Firefighters	Americas N=7 Europe N=2 Western Pacific N=1	94,4% male	M age = 33-50	General mental health	Proactive coping	-	-	- sleep disturbances - emotional intelligence - occupational stress - length of service - social support
Geuzinge et al. (2020)	26	Firefighters 13 Paramedics 4	NR.	NR.	NR.	General mental health	-	-	-	Social embeddedness

		Police officers 9								
Greinacher et al. (2019)	31	Rescue workers Police Firefighters Paramedics Forensic interviewers Detectives Parole officers EMT Internet child abuse investigators	NR.	NR.	NR.	Secondary traumatisation - Secondary traumatic stress disorder - Compassion fatigue - Vicarious traumatisation	-	-	-	-
Guilaran et al. (2018)	24	Disaster responders Police Rescue workers Firefighters Military rescuers Recovery workers EMT Emergency dispatch Medical rescuers	Americas N= 15 Western Pacific N= 7 Europe N= 1 E Mediterranean N= 1	NR.	NR.	Psychological distress Anxiety PTSD	-	-	-	Social support
Haugen et al. (2012)	17	Firefighters Police WTC disaster workers Chernobyl cleanup worker	NR.	NR.	NR.	PTSD	-	-	CBT Exposure therapy Psychodynamic therapy Eclectic psychotherapy EMDR Behavioural activation therapy Medication - prazosin - carbamazepine - valproate - tianeptine	-

Haugen et al. (2017)	14	Police Army combat medics Rescue workers Paramedics	Americas N=12 Europe N=1	NR.	NR.	General mental health problems - PTSD - Depression - Alcohol use	-	-	-	Stigma - fear for lack of confidentiality - fear of negative impact on career Barriers - difficulty scheduling an appointment - not knowing where to get help
Hem et al. (2001)	20	Police	Americas N= 13 Europe N= 6 Western Pacific N= 1	NR.	NR.	Suicide	-	-	-	-
Hoell et al. (2023)	41	Paramedics	Europe N=19 Americas N=15 Western Pacific N=5 E Mediterranean N=2	69.7% male	M age 36.9	PTSD	-	-	-	-
Huang, Chu, et al. (2022) <i>Covid pandemic</i>	17	Paramedics Police EMS	Americas N=5 SE-Asia N=5 Western Pacific N=3 Europe N=2 Africa N=1 E Mediterranean N=1	NR.	NR.	Depression Anxiety Stress	-	-	-	-
Huang, Lee, et al. (2022)	28	Police EMS Firefighters paramedics	Americas N=13 Western Pacific N=8 Europe N=4 SE-Asia N=1 Africa N=1 E Mediterranean N=1	90.3% male	M age 30-40	Sleep disorders - Excessive daytime sleepiness - Obstructive sleep apnoea - Restless leg syndrome - Shift work disorder - Insomnia - Narcolepsy	-	-	-	-
Igboanugo et al. (2021)	29	firefighters	Western Pacific N=15 Americas N=9 Europe N=5	NR.	NR.	Depression Suicidality Non-depressive mental health problems Burnout Alcohol use disorders Sleep quality Physiological parameters and somatic disorders	-	-	-	Organisational stress Job demands Job resources Perceived discrimination and harassment Role ambiguity Social support Self-esteem
Janssens et al. (2018)	22	Police	Europe N=5 Americas N=12	78.4% male	M age	General mental health PTSD	-	-	-	Resilience

			Western Pacific N=4 SE-Asia N=1 Africa N=1		25.3-54.4					
Jones (2017)	27	Firefighters EMT Paramedics	Americas N=15 Europe N=7 Western Pacific N=5 Africa N=1	NR.	NR.	PTSD Depression Suicidality Alcohol use Sleep disturbance General psychopathology	-	-	-	-
Khoshakhlagh et al. (2023)	47	Firefighters	Americas N=19 Western Pacific N=17 Europe N=8 E Mediterranean N=3	Majority male	NR.	Sleep disorders	-	-	-	Shift work
Krishnan et al. (2022)	20	Police	Africa N=9 Americas N=8 Europe N=2 Western Pacific N=1	NR.	Age 32-40	Suicidality	-	-	-	Problematic substance use PTSD symptoms Depression diagnosis Burnout Job dissatisfaction Civil status Relationship problems
Kyron et al. (2021)	66	Police 33 Firefighters 18 Paramedics 6 (mixed pop 9)	Europe N=18 Americas N=32 Western Pacific N=13	NR.	NR.	PTSD Depression Sleep disturbances General psychopathology Suicide	- Rumination	-	-	- inhibited retrieval of positive memories - peritraumatic dissociation and negative emotional states - neuroticism - social support - prior mental health issues - job strain - job resources
Laureys and Easton (2020)	54	firefighters	Europe N=21 Americas N=16 Western Pacific N=6	NR.	NR.	Resilience	-	-	-	-
Lawn et al. (2020)	39	Ambulance personnel	Europe N=15 Americas N=15 Western Pacific N=9 E Mediterranean N=1	NR.	NR.	Psychological well-being	-	-	-	-
Lees et al. (2019)	43	Law enforcement	Europe N= Americas N= Western Pacific N= SE-Asia N= Africa N=	NR.	NR.	PTSD Anxiety Fatigue Sleepiness	-	-	-	-

			E Mediterranean N=							
Loo (2003)	27	Police	Americas N=22 Europe N=3 Western Pacific N=1 Mixed N=1	NR.	NR.	Suicide	-	-	-	-
Lu and Petersen (2023)	12	Police	Europe N=5 Americas N=5 Western Pacific N=1 SE-Asia N=1	NR.	NR.	Resilience Depression Anxiety Perceived stress	-	-	CBT Mindfulness ACT The model of sense of coherence	-
Marshall et al. (2017)	21	Police Firefighters	NR.	NR.	NR.	PTSD Common mental disorders	-	-	-	- physiological factors - personality traits - coping style - social factors
Morris et al. (2022)	8	Firefighter 2 Police 4 first responder 2	Americas N=4 Europe N=3 Western Pacific N=1	47.57% male	M age 41.9	PTSD	-	-	EMDR	-
Neria et al. (2011)	10	Rescue and recovery 9/11	Americas N=10	NR.	NR.	PTSD	-	-	-	-
Opie et al. (2020)	62	Disaster relief workers - firefighters - police	Americas N=27 Europe N=16 Western Pacific N=14 E Mediterranean N=4 SE-Asia N=1	NR.	NR.	Common mental health disorders	-	Pre-employment and pre-deployment psychological screening	-	Age Gender Ethnicity Mental health history History of trauma History of life stressors Previous disaster relief work experience Personality traits
Petrie et al. (2018)	27	Ambulance personnel	Europe N=14 Americas N=8 Western Pacific N=4 Africa N=1	78.1% male	M age 34.9 Range 18-66	PTSD General psychological distress Depression Anxiety	-	-	-	-
Purba and Demou (2019)	15	Police	Europe N=5 Americas N=5 Western Pacific N=2 Africa N=2 SE-Asia N=1	78.8% male	Most m age 34-40	Occupational stress Anxiety Depression Psychological distress	-	-	-	Organisational stressors

						Burnout (emotional exhaustion, depersonalisation, personal accomplishment) Suicidal ideation				
Reardon et al. (2020)	5	paramedics	Americas N=2 Europe N=1 Western Pacific N=1 Africa N=1	NR.	NR.	Burnout	-	-	-	-
Regehr et al. (2019)	17	Police	Europe N=10 Americas N=7	85.7% male	NR.	PTSD Acute stress disorder Major depressive disorder Anxiety disorders	-	-	-	-
Sahebi et al. (2021)	13	Emergency medical services Paramedics EMT	E Mediterranean N=13	NR.	NR.	Occupational burnout (emotional exhaustion, depersonalisation, lack of personal accomplishment)	-	-	-	-
Sahebi et al. (2020)	3	Firefighters	E Mediterranean N=3	NR.	M age 31-41	PTSD	-	-	-	-
Sawyer et al. (2022)	20	paramedics	Western Pacific N=20	NR.	NR.	Anxiety Depression Stress PTSD Burnout Suicidality	-	-	-	-
Serrano-Ibáñez et al. (2022)	19	Firefighters	Europe N=5 Americas N=5 Western Pacific N=10	90.8% male	M age 30-40	PTSD	- Intrusive rumination - suppression - minimisation - blame - disengagement	-	-	Risk factors - the number of traumatic events - peritraumatic suffering - indirect experience - colleague-related trauma - daily hassles - operational stress (e.g. working hours) - organizational stress (e.g. management or excessive administration duties) - burnout

										<ul style="list-style-type: none"> - social introversion Protective factors - belongingness - perceived social support - trait mindfulness
Sherwood et al. (2019)	20	police	Americas N=11 Europe N=7 Western Pacific N=1 SE-Asia N=1	NR.	NR.	Depression Anxiety PTSD Burnout	Cognitive restructuring Active coping	-	-	<ul style="list-style-type: none"> Gender Physical health Neuroticism Introversion Sleep quality Social support Commitment
Smith et al. (2019)	156	9/11 first responders	Americas N=156	NR.	NR.	PTSD General mental health challenges	-	-	-	-
Sørensen et al. (2022)	19	Police	Europe N=10 Americas N=9 Western Pacific N=1	68-100% male	M age 33-44	PTSD	-	-	-	-
Stanley et al. (2016)	63	Police 48 Firefighters9 EMTs/ Paramedics2	Americas N=45 Europe N=9 Western Pacific N=3 Africa N=3 Mixed N=1	NR.	NR.	Suicidal thoughts and behaviours	-	Together for Life	Together for Life	<ul style="list-style-type: none"> PTSD Marital problems Sleep disturbances Social support
Sterud et al. (2006)	39	Ambulance personnel	Europe N=24 Americas N=18 Western Pacific N=4	NR.	NR.	PTSD Burnout Depression Anxiety	-	-	-	-
Syed et al. (2020)	75	Police	Europe N=19 Americas N=31 Western Pacific N=7	76% male	M age 39.1	PTSD Depression Alcohol misuse Anxiety Suicidal ideation Drug misuse	-	-	-	-
Thielmann et al. (2022)	33	Emergency medical service	Europe N=18 Americas N=7 Mediterranean N=4 Western Pacific N=3	76.2% male	M age 30-40	Stress and strain Well-being	-	-	-	-
Vadvilavičius et al. (2023)	8	Police	Europe N=4 Americas N=4	66.9% male	NR.	Stress reduction	-	-	Mindfulness based	-
Verbeek and Van der Velden (2016)	3	Police in Spanish	Europe N=2 Americas N=1	91.9% male	NR.	PTSD	-	-	-	-

		speaking countries								
Violanti et al. (2019)	44	Law enforcement	NR.	NR.	NR.	Suicide	-	-	-	-
Wagner et al. (2019)	16	police	Americas N=8 Western Pacific N=4 SE-Asia N=2 Europe N=1	86.7% male	NR.	Anxiety Depression	-	-	-	-
Wagner, White, Fyfe, et al. (2020)	35	police	Americas N=20 Europe N=6 Western Pacific N=6 Africa N=2 E Mediterranean N=1	89.5% male	NR.	PTSD	-	-	-	Routine work-related critical incident exposure Sociodemographic factors Peritraumatic factors post traumatic factors
Wagner, White, Randall, et al. (2020)	22	Firefighters	Americas N=10 Western Pacific N=6 Europe N=4 E Mediterranean N=2	99.8% male	NR.	Trauma related mental disorders PTSD MDD Anxiety disorders	-	-	-	Type of disaster exposure Duration on scene of disaster Contact with deceased bodies
Wagner, White, Regehr, et al. (2020)	22	Ambulance personnel	Europe N=10 Americas N=9 Western Pacific N=2 Africa N=1	74.3% male	NR.	Trauma related mental disorders PTSD Depression Anxiety	-	-	-	Sociodemographic factors Pre-exposure preparedness training Peritraumatic factors
Webster (2013)	103	Police	Europe N=3 Americas N=68 Western Pacific N=8 Mixed N=2 Other N=22	NR.	NR.	Occupational stress	Approach coping Avoidant coping	-	-	Adaptive characteristics Maladaptive characteristics Past experiences Effort-reward calculation Control/authority evaluation Social support Resource drains Resource gains
Wesemann et al. (2022)	33	Disaster workers Police 30 Firefighters6 Paramedics5 NGO 5 Search and rescue 2	Americas N=25 Europe N=6 E Mediterranean N=1	84.4% male	M age 36-49	Acute stress disorder PTSD Major depression Anxiety	-	-	-	- Proximity to the centre of the attack
Wild et al. (2020)	13	Firefighters3 Police 10	Americas N=7 Europe N=3 Western Pacific N=3	79% male	NR.	Well-being Resilience to stress	-	-	Physical exercise interventions Psychological interventions	-

									Stress management interventions Self-regulation interventions	
Wilson (2015)	20	Police6 Firefighters9 Ambulance personnel 1	Americas N=17 Europe N=3	NR.	NR.	PTSD	-	-	-	-
Winders et al. (2020)	25	Medical personnel Police Red cross Red crescent Rescue workers Military Disaster workers Fire and emergency responders	Americas N=10 Western Pacific N=7 Europe N=6 E Mediterranean N=2	NR.	NR.	PTSD Depression Anxiety	-	Pre-traumatic vaccination	Critical incident stress debriefing Mindful meditation CBT Other forms of psychotherapy or debriefing	-
Withrow et al. (2023)	5	Police	Americas N=3 Europe N=2	61.1% male	NR.	Anxiety Depression Sleep disturbances Burnout	-	-	Mindfulness	-

Note: # = number of articles included in the systematic review; MH disorder / concern = Mental health disorder / concern; NR. = not reported; E Mediterranean = Eastern Mediterranean; SE Asia = South-East Asia; NGO = non-governmental organisation; PTSD = Post traumatic stress disorder; MDD = Major depressive disorder; EMDR = Eye movement desensitization and reprocessing; CBT = Cognitive behavioural therapy; ACT = acceptance and commitment therapy; EFR = Emergency first responder

Table 2: Main findings

Article		Main Findings
Authors (year)	#	
Acquadro Maran et al. (2022)	20	<ul style="list-style-type: none"> - A major source of stress is a lack of support from supervisors. This lack of support increases PTSD symptoms in police officers. - A lack of organisational social support increases the risk for suicidality and depression.
Agrawal and Singh (2020)	43	<ul style="list-style-type: none"> - Police tend to report lower depression than nontraditional / community responders despite experiencing more trauma. The authors explained the unexpected result with reasons like selection process, training, and underreporting due to stigma. - organizational factors irrefutably influence police depression over and above police factors. Therefore, police stress inquiry should focus on organizational issues. Modifiable stressors and psychological training intervention programs can address the mounting concern of depression in the police. - resilience training can help officers recover from trauma aftereffects and manage their day-to-day hassles
Aguayo et al. (2017)	43	<ul style="list-style-type: none"> - Depersonalisation is slightly more prevalent in younger police officers, compared to older police officers. - Emotional exhaustion is slightly more prevalent in women police officers, compared to men. - Emotional exhaustion and the sense of personal achievement is higher in police officers in a relationship with emotional connection.
Alden et al. (2020)	21	<ul style="list-style-type: none"> - Trauma focused therapies are effective in reducing symptoms of post-traumatic stress. This is supported by both RCT and case studies with individuals and small groups. - Work leave after a worker develops post traumatic symptoms does not show many benefits in reducing the symptomatology.
Alshahrani et al. (2022)	15	<ul style="list-style-type: none"> - Psychological interventions are effective in reducing PTSD symptoms, depression, and anxiety. - Psychological interventions are not effective in reducing stress. - CBT demonstrates superior effectiveness compared to other interventions in treating PTSD but not in depression. - Moderators for intervention effectiveness are number of sessions for PTSD, with more sessions being more effective, and age for anxiety, with a higher age being associated with better treatment effectiveness. - Interventions delivered by clinicians were more effective than those delivered by non-clinicians. - EMS are an understudied group, whilst PTSD is found to be higher in EMS compared to other first-responder professions.
L. J. C. Alves et al. (2023)	41	<ul style="list-style-type: none"> - Age, gender, marital and parental status, education and ethnicity are not clearly associated with burnout. - Occupational factors, such as work schedules and high responsibilities, are consistently found to be risk factors for burnout. - Social interactions are consistently found to be a protective factor. - (Consistent) operational stress has a direct relationship with burnout. - Maladaptive coping strategies, including avoidance and distancing, manipulative behaviors, mental disengagement, assuming excessive responsibility, aggressive confrontation, emotional fixation, and wishful thinking, were linked to heightened levels of burnout. - Positive coping methods, such as maintaining adequate sleep, incorporating regular work breaks, engaging in positive reappraisal, actively coping with stressors, seeking social support, practicing assertiveness, exercising self-control, and strategizing problem-solving approaches, correlate with reduced levels of burnout - Factors contributing to burnout risk include high workload, insufficient recognition, limited control, perceived unfairness, inadequate social support, conflicts in roles, ambiguity in roles, absence of effective leadership, operational stressors, neurotic tendencies, negative emotions, and maladaptive coping mechanisms such as avoidance. - Protective factors against burnout include social support networks, health-promoting leadership styles, psychological resilience, agreeableness, extroversion, openness to new experiences, proactive problem-solving coping strategies, and regular physical exercise.
S. B. Alves et al. (2023)	7	<ul style="list-style-type: none"> - The effectiveness of sleep education programs in enhancing sleep quality remains a subject of inquiry. - Researchers have observed that firefighters often resort to substance abuse and alcohol consumption as a short-term coping mechanism for occupational challenges.
Auth et al. (2022)	24	<ul style="list-style-type: none"> - Work organisations can exert influence on the mental health of their employees, as summarized in the themes relating to mental health contribution and help seeking behaviours. - Senior members can positively influence mental health by delivering educational sessions about mental ill health to reduce stigma. They can negatively influence mental health by not providing downtime after a critical incident. - The organisation has a responsibility to “dismantle barriers to help seeking and reduce stigma related to mental ill health and vulnerability”.
Berger et al. (2011)	29	<ul style="list-style-type: none"> - Ambulance personnel exhibited a higher prevalence of PTSD compared to firefighters and police officers following exposure to a major disaster.

		<ul style="list-style-type: none"> - Studies from Asia reported significantly higher PTSD prevalence compared to Europe, and non-significantly higher than North America. - Mean age is inversely associated with PTSD prevalence. - The combined global prevalence of PTSD among rescue workers stands at 10%.
Bevan et al. (2022)	5	<ul style="list-style-type: none"> - Social support and positive working relationships serve as potential protective factors against professional stressors. - Night shifts, heavy workloads, disrupted sleep-wake patterns, understaffing, and secondary employment were identified as factors contributing to decreased job satisfaction and increased risks of burnout and fatigue. - Physical pain and sustaining a physical injury on the job increases psychological stress. - Gaining a sense of purpose on a job, e.g. through social connection with an affected community, allows disaster workers to withstand physical and mental stress. - “Rigid hierarchical structures, power dynamics, and imbalances can create additional psychological stressors for recovery workers.”
D. Brooks and Brooks (2021)	18	<ul style="list-style-type: none"> - Dysfunctional coping strategies are associated to increased severity of PTSD. - Alexithymia is associated with all current PTSD symptoms. - How a person responds to an incident is associated with the probability of developing PTSD. - PTSS was significantly predicted by the lower the levels of positive personality traits. - Environmental predictors of PTSD are being exposed to a traumatic job, proximity, frequency, and direct threat.
S. K. Brooks et al. (2016)	111	<ul style="list-style-type: none"> - Pre-disaster training and information leads to better well-being outcomes post-disaster. - Longer employment in combination with successful experiences leads to positive outcomes, whereas longer employment in combination with unsuccessful experiences leads to negative mental health outcomes. - Negative pre-disaster life events are a risk factor for post disaster mental health problems. - Traumatic exposure alone is predictive of anxiety, depression, general distress and PTSD. - Exposure to serious injury or dead bodies are at an additional higher risk for the aforementioned psychological problems, as well as somatic problems and alcohol misuse. - Long hours and lack of time off from the disaster site increases the risk for mental distress. - Peri-traumatic dissociation increases the risk for PTSD and alcohol problems. - Role ambiguity, low perceived safety, being injured, exposure to significant post-disaster life events and deliberate avoidance of traumatic thoughts leads to increased distress and risk for poor mental health outcomes. - Poor social support is associated with lower treatment seeking in addition to poorer mental health outcomes. - Positive coping mechanisms are associated with post-traumatic growth.
S. K. Brooks et al. (2015)	61	<ul style="list-style-type: none"> - Pre-disaster training and information is highly valued by disaster response workers. - The risk of depression is greatest during the initial mission, declines for the second, and peaks after five or more missions. - Working in an incident’s epicentre has a higher risk of poor mental health outcomes than working along the perimeter. - Identification with incident survivors leads to more intrusive thoughts. - Organisational and social support impacts the well-being of disaster response workers. - Lack of role clarity is a stressor. - A lack of safety measures increases anxiety and PTSD symptoms. - Positive coping strategies are protective against poor well-being. - Younger age at deployment is associated with poorer outcomes.
Casas and Kegel (2023)	31	<ul style="list-style-type: none"> - Participants describe their mental health in terms of emotions, cognitive difficulties and behavioural problems. - The police culture is the most problematic organisational stressor. - Stigma and poor mental health literacy are challenging toward mental well-being. - Utilising mental health resources is hindered by cultural norms and stigmatised beliefs.
Claringbold et al. (2022)	19	<ul style="list-style-type: none"> - Psychological debriefing leads to decreased anger, stress and alcohol use and increased social support and quality of life. - Mental health literacy programs for managers, emotional disclosure in writing, mindfulness smartphone app, social support and physical activity all improve employee mental health or well-being. - mindfulness training improves adaptive resilience over time.

		<ul style="list-style-type: none"> - Interventions involving mindfulness, physical activity, managerial mental health training, psychological debriefing, and enhanced social support have shown improvements in mental health and overall wellbeing.
Dautovich et al. (2023)	17	<ul style="list-style-type: none"> - Active, engaged coping is associated with better adjustment, whereas disengaged coping is associated with worse mental health outcomes. - Disengaged coping may exacerbate PTSD symptoms
Di Nota, Bahji, et al. (2021)	42	<ul style="list-style-type: none"> - The effectiveness of organisational programmes targeting post-traumatic stress is unclear. - Self-guided and internet-based programs experienced low participant adherence and completion rates. - All programs led to statistically significant decreases in PTSD symptoms post-training, alongside improvements in general psychological health, depression, burnout, stress, anxiety, and PTSD, as well as noteworthy enhancements in well-being, coping mechanisms, and resilience measures. - The improvements lasted for more than 18 months for PTSD and coping. - Resilience promotion reduces symptoms of burnout and depression. - Multimodal programmes improve measures of general psychological health.
Di Nota, Kasurak, et al. (2021)	13	<ul style="list-style-type: none"> - Coping is rarely studied as a primary outcome and is more often included as an additional measure of broader psychological health and functioning. - The utilization of effective coping strategies and associated psychological benefits are short-lived.
Díaz-Tamayo et al. (2022)	31	<ul style="list-style-type: none"> - Avoidant coping is strongly related to PTSD, burnout, chronic stress and psychiatric morbidity. - When coping is classified in the categories adaptive / nonadaptive, nonadaptive coping is found to be related to PTSD. - Adaptive strategies, such as seeking peer and employer support is related to greater well-being and posttraumatic growth.
Diggin et al. (2023)	11	<ul style="list-style-type: none"> - There is a weak to moderate association between coping strategies (such as problem-solving, emotion focussing, seeking social support, and avoidance) and burnout. The evidence is limited and inconsistent. - The impact of a low level of training may influence how one perceives their control over the situation, and in turn, affect burnout levels. - Limited evidence from this review suggests a general correlation between emotion-based coping strategies and higher burnout. - Findings from this review revealed a consensus between higher levels of burnout and avoidance coping strategies.
Doody et al. (2021)	13	<p>Resilience</p> <ul style="list-style-type: none"> - CBT, mindfulness programmes, and stress management programmes were successful in building resilience. <p>PTSD</p> <ul style="list-style-type: none"> - The effectiveness of stress management programmes and attention bias modification training in reducing PTSD risk is weak, no conclusion can be drawn on the effectiveness of these pre-deployment training programmes. <p>Depression</p> <ul style="list-style-type: none"> - No conclusions on the effectiveness of pre-deployment programmes to prevent depression are possible currently. <p>Stress</p> <ul style="list-style-type: none"> - Pre deployment stress management, mindfulness and biofeedback-based interventions all proved to be successful methods at reducing and safeguarding against stress.
Du et al. (2022)	25	<ul style="list-style-type: none"> - Adequate PPE, Adequate training and Preparedness were associated with favourable mental health outcomes. - The covid pandemic, concern about bringing home infections, concern about contraction and admission of infection, staff shortages and not wanting to let patients down were consistently associated with unfavourable mental health outcomes. - A lack of association is found between mental health outcomes and years of work experience, marital status and parental status. - In anticipation of a disease outbreak, men report higher expectations of anxiety than women, whereas women report higher levels of stress and anxiety during the outbreak itself.
Edgelow et al. (2021)	89	<ul style="list-style-type: none"> - Group mental health training programs were the most frequently utilized implementation approach. Less commonly employed strategies included debriefing, individual activities, or quality improvement initiatives. - According to the literature, supervisor mental health training resulted in a notable decrease in employee sick leave. - Stress management, resiliency training, and relaxation programs constituted the most prevalent form of primary prevention in workplace interventions. - A smaller subset of interventions fell under secondary prevention, characterized by enhanced psychological support, debriefing sessions, peer mentoring, and suicide prevention measures. - Primary prevention programs could be perceived as more cost-effective for organizations in preventing employees from developing trauma-related mental health conditions, rather than addressing symptoms once they emerge.
Galanis et al. (2021)	29	<ul style="list-style-type: none"> - Increased age is associated with higher stress, as is being married and being male.

		<ul style="list-style-type: none"> - Negative work-related conditions increase stress. - Exposure to critical incidents increased stress. - Physical risk due to patient diseases or patients' behaviour is a stressor. - Decreased physical exercise, lack of hobbies and smoking are stressors. - Negative and maladaptive coping strategies, including self-distraction, denial, self-blame, humorlessness, lack of planning, lack of control, and avoidance, have been associated with increased stress levels. - Various negative personality traits, including neuroticism, psychoticism, introversion, and reduced resilience, were linked to heightened stress levels.
Garbarino et al. (2019)	18	<ul style="list-style-type: none"> - Poor sleep is not associated with gender, age BMI or hierarchical role. - Shift work seems to correlate with sleep deprivation and poor sleep quality among police officers. - A notable correlation exists between sleep quality and mental health quality, yet determining the causal direction remains inconclusive.
Garmon-Jones et al. (2023)	10	<ul style="list-style-type: none"> - Psychological distress and psychosomatic disturbances showed a significant association with sleep disturbances, although the causal direction remains unclear. - Proactive coping is negatively correlated with depression, anxiety, and obsessive-compulsive symptoms. - The relationship between biological, social and psychological factors and the experience of mental health is yet unclear. - The length of service is significantly associated with increased psychological distress. - Social support might serve as a protective factor against psychological distress. - In the current literature, PTSD in firefighters is broadly studied, other mental health conditions have been less studied.
Geuzinge et al. (2020)	26	<p>Relevant Supportive Relationships</p> <ul style="list-style-type: none"> - For firefighters, emotional support from supervisors, family and friends is positively associated with resilience and negatively associated with perceived work stress. - For EMS, general workplace belongingness, peer support and supervisor support is positively associated with general psychological well-being. - For police, good and effective work cooperation and work-partner trust can lower negative effects from stress, whereas supervisor undermining and negative peer interactions can increase negative affect.
Greinacher et al. (2019)	31	<ul style="list-style-type: none"> - Secondary traumatisation stress rates are reported to be between 4% and 13%. - Female first responders exhibited higher symptoms of secondary traumatic stress than males, suggesting that females may be more susceptible to secondary traumatization. - There is an association between secondary traumatisation stress and burnout.
Guilaran et al. (2018)	24	<ul style="list-style-type: none"> - Anxiety and psychological distress are the sole clinical outcomes linked to social support. Moreover, psychological distress is the only outcome for which a time-lagged effect of social support was identified. - The effect sizes are small to medium, indicating a considerable amount of variance in psychological outcomes that remains unexplained by social support.
Haugen et al. (2012)	17	<ul style="list-style-type: none"> - Most treatment studies reported improvements on PTSD symptoms post treatment. - There is a bias in first-responder studies towards reporting on police mental health.
Haugen et al. (2017)	14	<ul style="list-style-type: none"> - One in three first responders report experiencing mental health stigma, and one in eleven report experiencing barriers to care. - There is a positive association between stigma and alcohol use disorder, depression and PTSD. PTSD and depression are also associated with experiencing barriers of care.
Hem et al. (2001)	20	<ul style="list-style-type: none"> - Research on suicidality in police is inconclusive. Whether police are more at risk for suicidality is unclear in 2001.
Hoell et al. (2023)	41	<ul style="list-style-type: none"> - The prevalence estimate of PTSD in EMS was 20.0% - Exposure to vague events is associated with higher PTSD rates, exposure to discrete events is associated with lower rates. - The prevalence rates of PTSD are higher than the non-trauma-exposed general population (3%) and the trauma-exposed general population (12%, human made disaster, 16 %natural disaster) - PTSD prevalence rates were equal across included continents.
Huang, Chu, et al. (2022) <i>Covid pandemic</i>	17	<ul style="list-style-type: none"> - The combined prevalence of depression among first responders attending medical emergencies was estimated at 31%, with 67% experiencing mild depression, 24% moderate depression, and 16% severe depression. Specifically, among first responders, paramedics reported a prevalence of 37% for depression, EMS personnel 28%, and police officers 22%. The prevalence of depression across continents was as follows: 39% in South America, 34% in North America, 30% in Asia, 29% in Africa, and 15% in Europe. - The combined prevalence of anxiety among first responders attending medical emergencies was estimated at 32%, with 60% experiencing mild anxiety, 27% moderate anxiety, and 14% severe anxiety. Specifically, among first responders, paramedics reported a prevalence of 38% for anxiety, EMS personnel 28%, and police officers 19%. The prevalence of anxiety across continents was as follows: 44% in South America, 34% in Asia, 33% in North America, 30% in Africa, and 9% in Europe.

		<ul style="list-style-type: none"> - The combined prevalence of stress among first responders attending medical emergencies was estimated at 17%, with 58% experiencing mild stress, 22% moderate stress, and 19% severe stress. - The study revealed that marital status had a significant association with depression and anxiety, while gender and being a first responder (including paramedics and EMS personnel) did not. Married first responders were more likely to experience depression, whereas unmarried first responders were less likely to experience it.
Huang, Lee, et al. (2022)	28	<ul style="list-style-type: none"> - The combined prevalence of shift work disorder among first responders attending medical emergencies was estimated at 31%. - The combined prevalence of obstructive sleep apnoea among first responders attending medical emergencies was estimated at 30%. - The combined prevalence of insomnia among first responders attending medical emergencies was estimated at 28%. - The combined prevalence of excessive daytime sleepiness among first responders attending medical emergencies was estimated at 28%. - The combined prevalence of restless leg syndrome among first responders attending medical emergencies was estimated at 2%. - The combined prevalence of narcolepsy among first responders attending medical emergencies was estimated at 1%. - First responders with obstructive sleep apnoea are more likely to develop mental health disorders. - First responders with insomnia are more likely to be at risk of developing depression, anxiety, and PTSD.
Igboanugo et al. (2021)	29	<ul style="list-style-type: none"> - Job-related stress influences firefighter mental health - Self-esteem, social support, and distress tolerance promote resilience, interpersonal conflict, discrimination, harassment, and perceptions of workplace unfairness discourage resilience. - Mental health problems appearing to be a result of workplace stressors are depression and burnout.
Janssens et al. (2018)	22	<ul style="list-style-type: none"> - A moderate positive correlation exists between psychological capital and psychological well-being, while weak to moderate negative correlations are observed between psychological capital, anxiety, and depressive symptoms.
Jones (2017)	27	<p>PTSD</p> <ul style="list-style-type: none"> - EMS reported symptoms of PTSD at rates of 20% and 22%, firefighters reported prevalence rates of 22% and 17%. - Protective factors may be high denial and low empathy. - Social support from family and work is a protective factor. - High work strain is associated with higher risk. - Predictive factors include previous psychological treatment, younger age of employment as a firefighter, and severity of horror felt after the worst incident. <p>Depression</p> <ul style="list-style-type: none"> - Depression and suicidality are understudied mental problems in firefighters, despite probable higher risk than the general population. - Some evidence exists for increased depression and suicidality. One study reports prevalence rates of suicidal ideation up to 46% in firefighters. <p>Alcohol use</p> <ul style="list-style-type: none"> - Heavy drinking is culturally accepted among firefighters. - There is weak evidence for increased alcohol abuse or alcohol use disorders among the population. However, this too is understudied. <p>Sleep disturbances</p> <ul style="list-style-type: none"> - 10% of ambulance workers reported fatigue levels that placed them at a significant risk for sick leave or disability..
Khoshakhlagh et al. (2023)	47	<ul style="list-style-type: none"> - The pooled prevalence of poor sleep quality in firefighters is 51%. - Poor sleep quality is non-significantly positively related to age. - Poor sleep quality is associated with shift work. - High income countries have a higher prevalence of poor sleep quality compared to lower middle-income countries.
Krishnan et al. (2022)	20	<ul style="list-style-type: none"> - More alcohol consumption is related to higher risk of suicidal ideation. - Alcohol consumption is negatively related to the ability to cope and to seek support. - Depression is associated with suicidality in police officers. - Incidence of suicidal ideation is slightly higher in women. - PTSD is associated with suicidality. Symptom high arousal is a predictor for suicidality in men, intrusive memories is a predictor for women. - Burnout components emotional exhaustion and depersonalisation are associated with suicidality. - Job dissatisfaction is significantly associated with suicidality. - Single, separated, or divorced police officers report increased rates of suicidality.

<p>Kyron et al. (2021)</p>	<p>66</p>	<ul style="list-style-type: none"> - Family conflicts is a predictor for suicidality. - Relative to the general population, emergency service personnel are at an increased risk for mental disorders, suicidality, substance use, chronic pain, and poor sleep patterns. - Definite conclusions on the effect of coping mechanisms are not possible, though rumination was significantly associated with PTSD. - Neuroticism is significantly associated with PTSD, burnout, and general poor mental health. - “Negative views of the self and self-efficacy prospectively predicted PTSD and depression symptoms prior to commencement of operational duties.” - Peritraumatic dissociation and negative emotional states predict future PTSD. - Social support is found to be a pre-, peri-, and posttraumatic protective factor. - Prior traumatic events and mental health issues are associated with future PTSD. - Physical and emotional job strain is significantly positively associated with burnout and emotional exhaustion. - The availability of sufficient job resources acts as a protective factor against mental health problems.
<p>Laureys and Easton (2020)</p>	<p>54</p>	<ul style="list-style-type: none"> - Thus far, no consensus exists on the definition of resilience in firefighters. One large discrepancy in the literature is the treating of resilience as either a trait or a process. - Building a clear conceptualisation of firefighter resilience is an important first step in improving research in this field. - Supporting factors of resilience are certain personality traits, social support, workplace culture and stressors, and adaptive coping strategies. - Studying resilience can lead to a better understanding of employee wellbeing, job satisfaction, and job performance
<p>Lawn et al. (2020)</p>	<p>39</p>	<ul style="list-style-type: none"> - Depression, anxiety, PTSD and suicidality are twice as high in EMS compared to other health professionals. - EMS are at risk for compassion fatigue and self-blame. - Substance use increases after exposure to critical incidents. - The aforementioned symptoms along with social withdrawal, have a negative impact on personal relationships and contribute to an increased sense of isolation. - Excessive occupational demands and a lack of organisational support is negatively associated with mental health. - Major events that induce substantial distress include neglect, abuse or harm, family violence, harm to colleagues, assault, suicide, drownings, grotesque mutilation, burns, the death of a baby or child, and those cases that had a personal significance to them. - Administrative tasks add to the perceived burden for EMS. - Additional stressors include work demands, the work environment, and a lack of control over work. - The coping strategy of compartmentalization may provide short-term benefits but could be detrimental in the long term. - Factors that may add to resilience are a sense of identity and status, structure and routine in the work, intellectual stimulation and finding meaning in the work. - Social and emotional support is protective against PTSD development. - Needs communicated by EMS are a broader recognition of the impact of work incidents that can cause significant distress, quality supervision, positive working relationships with peers and managers, and adequate response to workplace conflict. - EMS identify workplace violence as a common issue and undermining their mental health. They express a need for occupational safety measures. - EMS report receiving little organisational support when dealing with workplace stress, burnout, anxiety, and PTSD. - There is a stigma regarding mental health. Support often comes family and friends.
<p>Lees et al. (2019)</p>	<p>43</p>	<p>Anxiety</p> <ul style="list-style-type: none"> - Anxiety negatively impacts officer performance and health. - Intervention is effective in relieving anxiety symptoms, in particular stress management programmes focused on improving resilience and coping strategies are effective. - Prevention in the form of training in anxiety inducing situations can be effective. <p>PTSD</p> <ul style="list-style-type: none"> - Lifetime PTSD prevalence is around 8% following a critical incident. - Women report a higher prevalence of PTSD than men. - Police in general are a highly resilient group, although work environment can influence the individual officer’s resilience. - Intervention programmes should include substance abuse treatment, wellness training and family mental health services. Additionally, adaptive coping training can counter negative strategies. Prolonged exposure therapy and building emotional regulation should also be considered as treatment options. <p>Sleepiness and fatigue</p> <ul style="list-style-type: none"> - Extended shifts result in reduced sleep duration, diminished sleep quality, difficulties with concentration, impaired cognitive function, and an overall lower quality of life.

		<ul style="list-style-type: none"> - Mindfulness-Based Resilience Training resulted in enhancements in mindfulness, resilience, police perception of stress, reduction in burnout, improvement in emotional intelligence, mental health, physical health, reduction in sleep disturbance, and fatigue. - Improved roster systems can mitigate sleep and fatigue problems.
Loo (2003)	27	<ul style="list-style-type: none"> - Regional police forces have higher suicide rates than federal and municipal police forces. - Federal police force showed similar rates of suicide compared to a control population, regional police forces have higher rates and municipal forces have lower rates than the control population. - The Americas and Europe exhibit higher suicide rates compared to the Caribbean, Asian, and African regions. However, there is no significant difference in suicide rates between the Americas and Europe.
Lu and Petersen (2023)	12	<ul style="list-style-type: none"> - Psychological skills training programmes focussing on resilience, mindfulness and psychoeducation can mitigate the risk of depression and anxiety. But they do not show improvement on resilience and stress.
Marshall et al. (2017)	21	<ul style="list-style-type: none"> - Baseline psychopathology is not associated with mental health outcomes at follow up. - Trauma history is not associated with mental health at follow up. - Biological markers at baseline are predictive of PTSD, psychological distress, anxiety and acute stress disorder at follow up. - Trait dissociation and trait anger are associated with PTSD. - Neuroticism may be associated with PTSD vulnerability, but the evidence is inconclusive. - Pre-deployment coping strategies have a significant effect on mental health outcomes. - The evidence on social support is inconclusive but may mitigate PTSD symptoms.
Morris et al. (2022)	8	<ul style="list-style-type: none"> - All intervention studies report significant reductions in PTSD severity. - The efficacy of early intervention EMDR has not yet been evaluated
Neria et al. (2011)	10	<ul style="list-style-type: none"> - The prevalence of PTSD in 9/11 rescue and recovery workers was reported to be between 5.8% and 12.4% - Firefighters show an increase in PTSD prevalence during the years post 9/11. - Early arrival at the WTC site, long working duration at the site, loss of family or friends at the WTC, and 9/11-related job loss are associated with increased PTSD risk.
Opie et al. (2020)	62	<ul style="list-style-type: none"> - The evidence regarding the association with age is mixed. While most findings indicate no correlation between age and PTSD, anxiety, depression, psychological distress/morbidity, somatic symptoms, burnout, stress, peritraumatic dissociation, or hostility, some studies suggest that being older is linked to greater severity and a higher likelihood of PTSD, alongside a more adverse trajectory of this disorder and a higher probability of general psychological distress/morbidity. Conversely, other studies indicate that youth is associated with a higher probability of PTSD, anxiety, and depression. - Evidence regarding the association with gender is inconclusive. The majority of studies showed no correlation between gender and PTSD, depression, psychological distress/morbidity, peritraumatic dissociation, burnout, and stress. However, a minority of studies indicated that being a woman was associated with a higher likelihood of depression, PTSD, and greater severity of burnout. - Evidence regarding the association with ethnicity is varied. The majority of findings suggest no correlation between ethnicity and PTSD, anxiety, general psychological distress or morbidity, or burnout. However, a minority of studies reported that non-White participants were more likely to report PTSD. - A past history of mental illness was linked to increased severity and likelihood of PTSD, anxiety, and depression. - A background of trauma was correlated with greater severity and likelihood of PTSD, anxiety, and depression. - There is compelling evidence indicating that a history of life stressors predicts the development of mental health disorders post-deployment. - There is no conclusive evidence on the association between previous disaster experience and mental health problems. - Hardiness and resilience are associated with positive outcomes, neuroticism with negative. - The overall evidence for pre-deployment screening on the aforementioned variables is weak.
Petrie et al. (2018)	27	<ul style="list-style-type: none"> - The prevalence of PTSD in EMS is around 10% - The prevalence may be decreasing, as recent studies show lower prevalence rates. - The prevalence for depression and anxiety is 15% each. - There is evidence that the prevalence of PTSD is higher in EMS compared to the general population, no such evidence currently exists for general psychological distress.
Purba and Demou (2019)	15	<ul style="list-style-type: none"> - Organisational stressors associated with occupational stress are ridicule and set ups (intermediate effect size), bias (low), sexual harassment (low), language harassment (low), superiors support (low), lacks influence (low) and department issues (low)

		<ul style="list-style-type: none"> - organisational stressors associated with anxiety are job pressure (intermediate) - organisational stressors associated with depression are heavy workload (intermediate) and judgement from peers (intermediate) - organisational stressors associated with psychiatric symptoms or psychological distress are lack of support from superior and organisation (high), High mental/intellectual demand (intermediate), inadequate work schedule (intermediate), long working hours (≥ 49 h / week; intermediate), internal social stressors (low), effort reward imbalance (low) and over-commitment (low) - organisational stressors associated with burnout are administrative/organisational pressure (low) and police stress (low) - organisational stressors associated with emotional exhaustion are demand (high), job pressure (intermediate), long working hours (intermediate), social support (intermediate), lack of support (intermediate), organisational culture (intermediate), organisational climate (intermediate), decision latitude (intermediate), internal social stressors (low), Social support from co-workers and supervisors (low), social support (low), perceived workplace fairness (low), unfairness of the organisation (low), Lack of resources (low), demand (low), Administrative/Organisational pressure (low) and police stress (low) - organisational stressors associated with depersonalisation are decision latitude (intermediate), social support (intermediate), demand (intermediate), organisational culture (intermediate), organisational climate (intermediate), Social support from co-workers and supervisors (low), long working hours (low), demand (low), Lack of resources (low), leadership (low), Administrative/organisational pressure (low) and police stress (low) - organisational stressors associated with personal accomplishment are social support from co-workers and supervisors (low), Job pressure (low), Administrative/organisational pressure (low) and police stress (low) - No organisational stressors associated with suicidal ideation were found.
Reardon et al. (2020)	5	<ul style="list-style-type: none"> - The prevalence of burnout ranged from 16% to 56% - Risk factors include being female, having 5-15 years of experience, providing advanced life support, experiencing a high call volume, facing overload at work, encountering emotional and physical health problems interfering with work, and experiencing low job satisfaction. - Advancing age, parenthood, and being in a committed relationship could serve as protective factors.
Regehr et al. (2019)	17	<ul style="list-style-type: none"> - The prevalence of PTSD in police officers responding to the 9/11 attacks ranges from 2.9% to 11.9%. - Women officers have higher prevalence rates than men. - The prevalence rates of police responding to the 9/11 attacks is higher than the prevalence in the general population, but lower than other populations that experienced terrorist attacks. - It is found that the police PTSD prevalence rates correspond with their countries prevalence rates. That is, in countries with lower overall rates of PTSD, police report lower rates of PTSD and in countries with higher prevalence rates, this too is seen in the police population. - Stigma for PTSD remains in the police culture.
Sahebi et al. (2021)	13	<ul style="list-style-type: none"> - The frequency and intensity of occupational burnout are low for emotional exhaustion, moderate for depersonalization, and high for the lack of personal accomplishment. - The frequency of reported depersonalisation is increasing, the frequency for emotional exhaustion and lack of personal accomplishment is decreasing.
Sahebi et al. (2020)	3	<ul style="list-style-type: none"> - The overall prevalence of PTSD is 23.2%. There is an increasing trend over the years.
Sawyer et al. (2022)	20	<ul style="list-style-type: none"> - Anxiety, Depression, Stress, and PTSD: Women show higher mild anxiety and higher mild and moderate depression than men, prevalence rates were similar for the other categories. - Burnout: Men show higher burnout rates than women. - Suicidal thoughts and behaviours: No significant gender difference was found on the prevalence of suicidality.
Serrano-Ibáñez et al. (2022)	19	<ul style="list-style-type: none"> - Perceived stress is a predictor of PTSD. - Burnout is associated to PTSD. - Years of service predicts PTSD, potentially due to the increased exposure to traumatic events. - Rumination, expressive suppression, dissociation, disengagement, and minimization predict PTSD. - High belongingness and high dispositional mindfulness are protective factors.
Sherwood et al. (2019)	20	<ul style="list-style-type: none"> - Depression prevalence is higher in women investigating child abuse than men. - Depression is associated with higher BMI, neuroticism and introversion, low sleep quality and low social support. - Anxiety risk factors are similar to depression risk factors. - Cognitive restructuring, adaptive coping and commitment (finding meaning) were associated with lower anxiety. - Risk factors for PTSD are being female, neuroticism, depression, lower self-reliance, low self-resilience, passive coping and avoidance in women, emotional coping, and the frequency of critical incident exposure.

		<ul style="list-style-type: none"> - Protective factors for PTSD are agreeableness, conscientiousness in men, high self-worth, and social support. - Risk factors for burnout include high demand, effort, and overcommitment, work overload, role ambiguity, work-family conflict, inflexible working hours, perceived unfairness, and low organizational support. - Protective factors for burnout are emotional stability, social support and positive coping techniques.
Smith et al. (2019)	156	<ul style="list-style-type: none"> - The prevalence of PTSD in 9/11 responders is 20% for men and 26% for women. - Early arrival and longer duration at the site were risk factors for PTSD development. - Low social support increases PTSD persistence. - Long-term psychosocial challenges related to the 9/11 disaster response include survivor guilt, insomnia, relationship breakdowns and impact on family support systems, stress, addictive and risk-taking behaviours, PTSD, anxiety, and depression.
Sørensen et al. (2022)	19	<ul style="list-style-type: none"> - Police is at lower risk for developing PTSD after a critical incident when compared to the general population and other first responder populations. - One reason could be the qualifying admission test for the police academy and / or critical incident stress training.
Stanley et al. (2016)	63	<ul style="list-style-type: none"> - First responders (police, firefighters, and EMS) are at an elevated risk for suicidality than the general population. - Lower instance of suicidality may be explained by pre-enlistment screening. - The intervention “Together for life” is effective in decreasing suicide rates among first responders. - There is a large body of research on police suicidality, research on firefighter suicidality is emerging, EMS suicidality is currently understudied. - There is a significant relationship between PTSD and suicidality, marital problems and suicidality, and sleep disturbances and suicidality. - Social support acts as a protective factor against suicidality.
Sterud et al. (2006)	39	<ul style="list-style-type: none"> - The prevalence of PTSD in EMS is about 20% - Emotional coping is positively associated with PTSD symptoms. - Work-related stress is positively associated with PTSD symptoms. - The prevalence of burnout in EMS is not yet clear. - Low social support is associated with mental health problems.
Syed et al. (2020)	75	<ul style="list-style-type: none"> - The prevalence estimate for police depression is 14.6%, 14.2% for PTSD, 25.7% for hazardous drinking, 5% for alcohol dependence, 9.6% for anxiety, and 8.5% for suicidality. - The prevalence of PTSD is higher in Asia, South America, and Africa, compared to other continents. - Exposure to dead bodies and severe injuries is associated with a higher PTSD prevalence than exposure to disasters. - The prevalence of depression is higher in Asia, Africa and Australia, compared to Europe and North America. - Police PTSD risk factors are being female, greater trauma frequency, longer time in service, avoidant coping strategies, higher level of alcohol consumption, and high occupational stress. - Peer support is a protective factor for PTSD. - Depression risk factors are being female, and high generic occupational stress, the latter also being a risk factor to suicidality. - A risk factor for alcohol misuse is being male.
Thielmann et al. (2022)	33	<ul style="list-style-type: none"> - EMS show an increased prevalence of psychological stress. - Time pressures, volume of assignments, organisational influences, and lack of support are classified as strains for EMS. - There is an increased prevalence of burnout. - The prevalence for PTSD ranged from 1.4% to 40% - PTSD risk factors are identification with the victim and previous trauma experiences (personal or occupational). - Male EMS show more emotional exhaustion and depersonalisation. - Female with high alexithymia show higher burnout rates.
Vadvilavičius et al. (2023)	8	<ul style="list-style-type: none"> - Mindfulness based interventions are effective in reducing stress, psychological strain, and psychological stress-related symptoms.
Verbeek and Van der Velden (2016)	3	<ul style="list-style-type: none"> - PTSD prevalence in police officers of Spanish speaking countries ranged from 1.2% to 2.6%.
Violanti et al. (2019)	44	<ul style="list-style-type: none"> - Risk factors for suicide are alcohol use, domestic problems. - PTSD and depression are associated with officer suicide.

		<ul style="list-style-type: none"> - Female officers have a higher prevalence of depression. - Suicide prevention should focus on suicidal ideation, domestic problems and / or violence, mental health problems and substance use.
Wagner et al. (2019)	16	<ul style="list-style-type: none"> - Sociodemographic factors, gender and marital status seem unrelated to officer depression. - A positive association exists between depression and overcommitment, a negative association exists for control, support, and reward and depression. - A negative association exists between anxiety and extraversion, agreeableness, and emotional stability. - A positive association exists between anxiety and low perceived support, low perceived reward. - A gap exists in the studying of the association between critical incident exposure and anxiety and depression.
Wagner, White, Fyfe, et al. (2020)	35	<ul style="list-style-type: none"> - Sociodemographic factors seem to be largely unrelated to PTSD risk in police officers. - Critical incident factors associated with PTSD risk are type and frequency of exposure, the peritraumatic reaction. - Other existing mental disorders are predictors of PTSD risk. - Organisational influencing factors are understudied. - Outcome variability in PTSD prevalence can be explained by the wide variety of measurement tools used.
Wagner, White, Randall, et al. (2020)	22	<ul style="list-style-type: none"> - PTSD prevalence is higher in firefighters as compared to the general population. High variability exist with prevalence rates ranging from 0.9% to 32.5%. - Variability in measurement tool used explains some variation in prevalence. - PTSD seemed more prevalent for natural disasters, compared to man-made disasters, though this trend is non-significant. - Early arrival on a disaster site is associated with PTSD development, as is dealing with deceased bodies. - Depression is less studied than PTSD (prevalence between 3.8% to 36%), but early arrival on site seems to have a similar association to depression, as are retiring with disability and increased years of service. - Anxiety following disaster is the least well studied. Prevalence outcomes range between 10.2% and 27.2%.
Wagner, White, Regehr, et al. (2020)	22	<ul style="list-style-type: none"> - The prevalence of PTSD for EMS ranged from 0-60% - Sociodemographic factors and individual difference factors seem unrelated to PTSD outcomes. - Frequency and severity of critical incident exposure is associated with PTSD severity. - Preparedness training is associated with less severe PTSD symptoms. - Incident related stress, alcohol use, and operational and organisational stress are significantly associated with PTSD. - De prevalence of depression ranged from 6.4% to 42.9%, which is elevated compared to the general population. - Anxiety prevalence rates range from 6% to 33.9%, which is elevated compared to the general population.
Webster (2013)	103	<ul style="list-style-type: none"> - Adaptive personality characteristics in general have a modest effect on perceived stress, as do maladaptive personality characteristics. - Reward expectation has a modest impact on perceived stress. - Perceived job control is associated with lower perceived stress. - Social support has a small positive influence on lowering perceived stress. - Resource drains (work-family conflict, depression, workload, negative life events) taken together have a modest influence on perceived stress. - Past experiences or trauma have a modest influence on perceived stress. - Approach coping is negatively related with stress, whereas avoidance coping is positively associated with perceived stress.
Wesemann et al. (2022)	33	<ul style="list-style-type: none"> - After a terrorist attack PTSD prevalence range from 1.3% to 16.5%, for depression from 1.3% to 25.8%, and for anxiety from 0.7% to 14% - There is a large discrepancy in mental health disorder rates reported through clinical interviews and self-report questionnaires. - The occupational groups that conduct their work close to the centre of the attack have a higher prevalence of PTSD than those who for example are tasked with perimeter control. - Female emergency service personnel are at higher risk for mental health problems. - The other main risk factors identified are a lack of training on psychological risks, social isolation, work environment stress, peritraumatic stress and dissociation, losing someone at the disaster, physical injury, and older age. - Additional influencing factors include personal risk perception, preparation for the event, confidence in action, clarity of tasks on-site, quality of equipment, professional experience, duration and proximity to the event, and media reports on the organization's emergency services personnel (positive/negative). - Institutional peer support and destigmatisation programmes are effective in dealing with disasters.
Wild et al. (2020)	13	<ul style="list-style-type: none"> - Exercise and imagery interventions seemed effective in improving well-being and resilience.

		<ul style="list-style-type: none"> - In contrast, self-regulation and debriefing interventions could not be linked to any improvement in well-being and resilience. - A higher number of intervention sessions is associated with larger improvements.
Wilson (2015)	20	<ul style="list-style-type: none"> - The prevalence rates of first responder PTSD after terrorist attacks ranged from 1,3% to 22%. - Overall, police officers report lower levels of PTSD compared to firefighters and emergency medical services
Winders et al. (2020)	25	<ul style="list-style-type: none"> - Most intervention studies focus on treatment rather than prevention. - Psychological interventions (a wide range) were generally effective in reducing symptoms of anxiety, hyperarousal, and depression post-disaster. - Debriefing (including critical incident stress debriefing) seems to be not effective post-disaster. - A novel debriefing method called 512 PIM shows improvement on depression, anxiety and PTSD, but more research is needed. - There is some preliminary evidence that prevention programmes, such as pre-traumatic vaccination, can help, but more research is needed.
Withrow et al. (2023)	5	<ul style="list-style-type: none"> - Mindfulness intervention decreases depression symptoms (moderate effect). - Mindfulness had a small to moderate effect on decreasing anxiety symptoms. - Mindfulness had a small to moderate effect on decreasing burnout symptoms. - Mindfulness had a small non-significant effect on sleep.

Note: PTSD = Post traumatic stress disorder; EMS = emergency medical services; RCT = randomised controlled trial; CBT = cognitive behavioural therapy; PPE = personal protective equipment; WTC = world trade centre