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A review of the literature on emergency service worker mental health:

Development of a research agenda for the Centre of Excellence in Emergency Worker Mental Health

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Executive Summary

The aim of literature review was to inform the development of a research agenda for the Centre of Excellence in Emergency Worker Mental Health (CoE) by identifying gaps and opportunities to conduct novel research to improve mental health outcomes in emergency service workers (ESWs).

We reviewed the literature with the focus on CoE priorities: (1) the types of mental health conditions experienced by ESWs (including comorbidities), (2) treatments utilised in ESW populations, and (3) practitioner-related research.

Key findings 1:

- Prevalence studies showed that posttraumatic stress (PTSD), depression, and anxiety were the primary mental health symptoms experienced by ESWs.
- A range of comorbid symptoms were also highly prevalent and included alcohol misuse, pain, sleep disturbance, and suicidality, and some comorbid conditions (e.g., problem anger) commonly observed in other trauma exposed populations are yet to be fully examined in ESWs.

Action:

- Given the high prevalence of PTSD, depression, and anxiety observed in ESWs, we expect high levels of these symptoms in presentations to the Specialist Network of Clinicians (SNC). A major part of quality improvement outcome assessments should therefore include coverage across these symptom experiences.
- In addition to PTSD, depression, and anxiety, assessment of associated comorbid conditions should also be included, covering a range of symptom experiences including alcohol misuse, pain, sleep disturbance, suicidality, and anger.

CoE Research questions:

- What are the primary symptom profiles of ESWs seeking treatment through the SNC?
- Do we see improvements in PTSD, depression, and anxiety, in ESWs receiving treatment through the SNC?
- In addition to primary symptoms presenting in ESWs, is there resolution of comorbid symptom experiences in ESWs receiving treatment from the SNC?

Key findings 2:

- Treatment studies employed several different treatment approaches including a number of first-line PTSD treatments, adjunctive treatments, and mixed treatment approaches, however limited research examined personalised treatment approaches (e.g., measurement-based care) or use of contemporary digital technology to support clinical treatment in ESW populations.
- Treatment research typically assess mental health indices as treatment outcomes, and other important outcomes, such as occupational health or individual capacities to return to work, are often overlooked.
- Although a variety of factors can influence treatment outcomes, minimal investigations have been conducted in treatment studies to examine the effects of individual factors (e.g., comorbid symptom experience) may have on treatment response.

Action:

- Prospective CoE research may benefit from examining the utility of personalised treatments by adopting measurement-based care as part of treatment delivery and quality improvement processes.
- Integration of digital technology can be a useful means to support treatment; CoE research can advance intervention research by investigating the utility of digital treatment tools to support practitioners and patients.
- In addition to mental health outcomes, it is important for SNC outcome assessments to also cover ESWs occupational health during, and after, treatment and assess return to work as a treatment outcome.
- CoE research should include investigation of individual factors which influence treatment outcomes to better understand mechanisms of symptom change across time.

CoE Research questions:

- What is the feasibility and acceptability of digital health tools to assist with treatment delivery (e.g., via digital measurement-based care or digitised homework tasks)?
- What are the rates of return to work in ESWs receiving treatment through the SNC?
- How do comorbid conditions impact treatment and influence treatment outcomes?

Key findings 3:

- Practitioners possess a wealth of information and first-hand experience providing clinical treatment which can be explored to develop new and innovative ways to improve treatments.
- No practitioner-related research was identified in this review, highlighting opportunity for prospective CoE research to collaborate with practitioners to identify ways to improve treatment.
- Cultural competencies of mental health practitioners are highly relevant in the context of treating ESWs, and little research has been conducted examining its effects on treatment outcomes.

Action:

- CoE research should explore engagement with practitioners and ESWs to conduct experience-based co-design studies to examine effective means to improve treatment (e.g., assessing the utility, acceptability, and relevance of integrating digital tools into treatment)
- Prospective CoE research should include investigations surrounding cultural competency of practitioners and its role in treating ESWs.

CoE Research questions:

- For mental health practitioners, what are the most important ways digital tools could help with treatment delivery in ESWs?
- Can we devise an assessment of cultural competency of practitioners working with ESWs?
- How do practitioners' cultural competency influence ESW treatment outcomes?

Background

Emergency service workers (ESWs) provide essential services to ensure public health and safety during emergency situations and critical events. Emergency service work spans a range of occupations, including police officers, paramedics, firefighters, and state emergency services (SES) (e.g., Kyron et al., 2021). Due to the nature of their work, ESWs can be exposed to potentially traumatic events (PTEs) rendering them vulnerable to development of mental health conditions (McFarlane et al., 2009). Roughly 90% of first responders report experiencing workplace exposures to incidents which directly threaten their lives, and/or involve witnessing the deaths and horrific injuries of others (Alexander & Klein, 2001; Berger et al., 2012; Boffa et al., 2017; Corneil et al., 1999; Weiss et al., 1995). ESW exposure to these events has been associated with a higher incidence of a range of different mental health conditions than the general population including posttraumatic stress disorder (PTSD), depression, and anxiety (Kyron et al., 2021; Petrie et al., 2018). Although resilience and recovery following exposure to a singular traumatic event is common (Galatzer-Levy et al., 2018), ESWs may be at greater risk of developing mental health conditions due to continual and repeated exposure to highly stressful events as part of their employment (Brewin et al., 2000; McFarlane, 2010). Compounding these issues, numerous studies have highlighted organisational stressors (e.g., shift work, long hours, administrative/organisational pressure) as significant sources of distress among ESWs (Purba & Demou, 2019; Wagner et al., 2020), which can further increase vulnerability to poor mental health (Chan & Andersen, 2020; Meyer et al., 2012).

Effective evidence-based treatments are available for psychiatric disorders (e.g., Major Depressive Episode, anxiety disorders, and PTSD). For example, expert guidelines recommend trauma-focussed cognitive behavioural therapy (TF-CBT), eye movement desensitisation and reprocessing (EMDR), cognitive processing therapy (CPT), brief Eclectic Psychotherapy (BEP), Written Exposure Therapy (WET), Narrative Exposure Therapy (NET), or prolonged exposure (PE) be offered as first-line treatments for PTSD (American Psychological Association, 2017; Department of Veterans Affairs, 2017; Phoenix Australia, 2021). These interventions have also been demonstrated to be effective treatments for reducing PTSD symptoms in a variety of populations including military veterans, trauma exposed adults, and in some ESW populations (Acarturk et al., 2016; Bryant et al., 2019; Kitchiner et al., 2012; Varker, Kartal, et al., 2021). Despite the availability of such treatments, only approximately one third of patients receiving an evidenced-based PTSD treatment lose their diagnosis (Cusack et al., 2016), and although many individuals engage with treatment, a

noteworthy proportion do not complete treatment, with up to 40% of those being treated for PTSD dropping out of routine therapy (Kehle-Forbes et al., 2016; Varker, Jones, et al., 2021). It is also unclear whether guideline recommended interventions are as effective in ESWs (including volunteers and retired ESWs) as in other populations. Previous research has demonstrated that clinical treatments can be differentially effective across discrete samples (Foa et al., 2013). Due to the continued exposure to traumatic events and organisational stress of ESW work, tailored and specialised treatment approaches may be required for treatments to be optimally effective in ESWs. As such, there is a need to develop the evidence base through treatment-focused research, in order to better understand treatment of mental health conditions in ESWs and improve treatment outcomes.

To this end, the current research was commissioned by the Centre of Excellence in Emergency Worker Mental Health (CoE) initiative led by Phoenix Australia—Centre for Posttraumatic Mental Health—to survey the current landscape of research relating to ESW mental health. The primary aim of this work is to inform the development of a research agenda to guide prospective CoE research by identifying gaps in existing ESW research and recognising opportunities to conduct studies to improve mental health outcomes for treatment seeking ESWs. To achieve this, we conducted a review of the ESW research literature in line with key priorities of the CoE to:

1. Describe the types of mental health conditions experienced by ESWs, including the prevalence of primary mental health conditions, and associated comorbidities.
2. Provide a summary of treatment studies conducted in ESW populations, including the types of first-line therapies utilised, as well as any novel, emerging, or innovative treatment approaches.
3. Describe practitioner-related research relevant to treatment of mental health conditions in ESWs.

Methods

A search strategy was developed and implemented to capture available evidence surrounding ESW mental health. Resultant data were screened to identify relevant studies, before being sorted into relevant categories for review and synthesis. Categories reflected key aims of the study, and specific parameters were established to guide categorisation of included studies (Table 1). For further details regarding study methods, refer to Appendix A.

Table 1. *Parameters for sorting studies into categories reflecting primary aims of the study.*

Aim/Category	Categorisation parameter
1. Types of mental health conditions experience by ESWs	a) Studies reporting on the prevalence rates of mental health conditions in ESW sample using either an empirical or review-based methodology. For empirical research, included studies were limited to those with adequately sized samples* b) Studies examining associations between mental health conditions and other health conditions in ESWs
2. Treatment studies conducted in ESW populations	a) Studies describing mental health treatment in ESW populations
3. Practitioner-related research relevant to mental health treatment in ESWs.	a) Studies including assessment of mental health outcomes as a result of any practitioner-related variable.

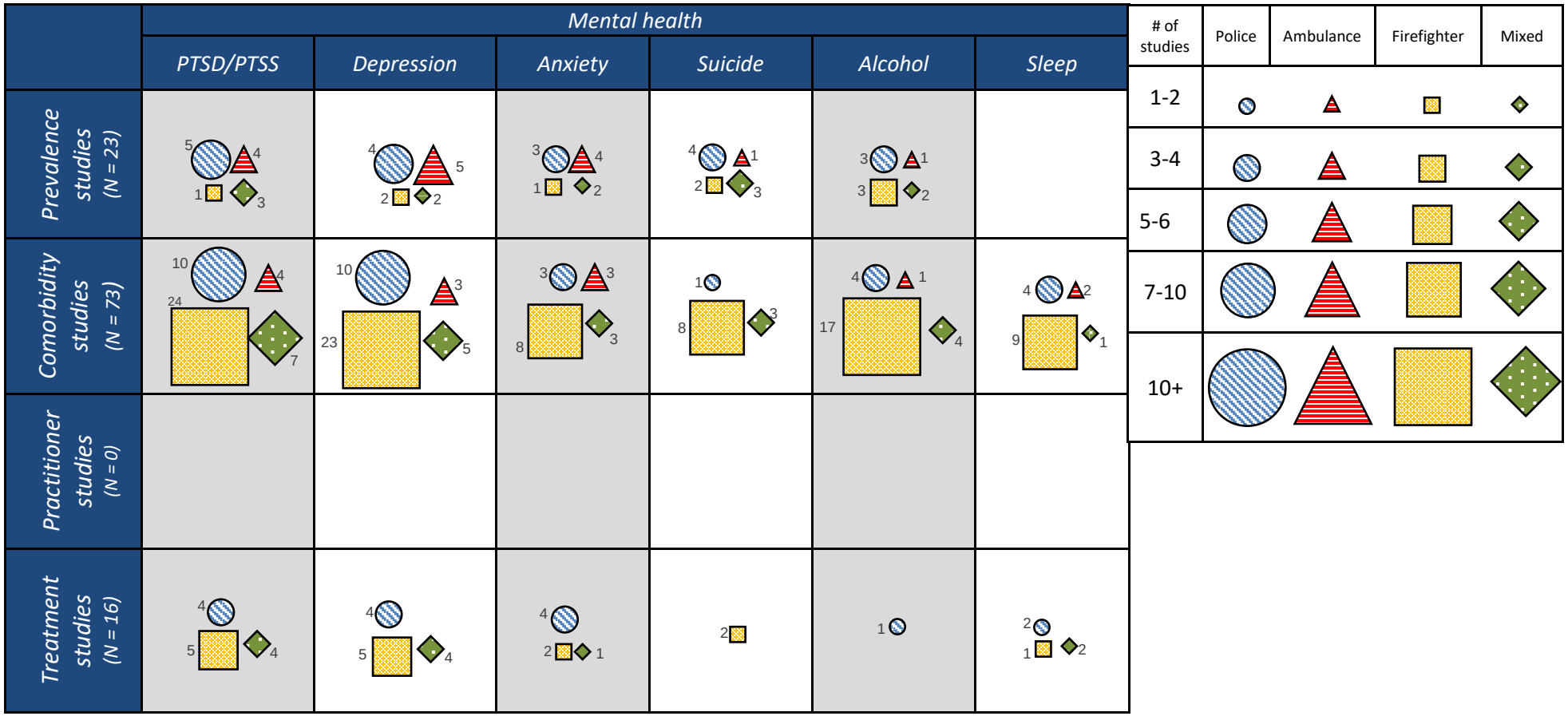
* defined in this study as >800 participants (Munn et al., 2014).

Results

Four thousand, seven hundred and forty-eight studies were identified in the initial search. Of these, 1992 were identified as duplicates. Based on title screening, 1901 studies were excluded. The remaining 855 studies were subject to title and abstract screening. One hundred and fifty-one studies were excluded for not presenting original research (comprising a mixture of book chapters, supplementary documents, unavailable references, and conference proceedings). The final 704 studies were screened and categorised according to the parameters in Table 1. A total of 112 studies were successfully categorised (see Appendix B for flow of study categorisation).

Table 2, illustrates the distribution of studies across prevalence, comorbidity, practitioner, and treatment focussed domains for each mental health condition represented. The bulk of research focussed on mental health conditions experienced by ESWs (category 1a) including 23 studies (21%) examining prevalence rates of mental health conditions in ESWs, and 73 studies (65%) investigating comorbidities (or relationships) between mental health conditions (category 1b). Fewer studies have examined treatments of

Table 2. *The distribution of research examining mental health conditions in prevalence, comorbidity, practitioner, and treatment focussed research*.*



*as individual studies often examine multiple health conditions, they may be represented in multiple cells.

mental health conditions in ESWs (category 2), with only 16 studies (14%) categorised as such, and no studies were identified relating to practitioner-based research (category 3). Overall, 33 studies (29%) were conducted in police sample, eight (7%) in an ambulance sample, 51 (45%) in firefighter samples, and 20 (18%) were conducted in mixed samples of ESWs (any combination of police, firefighter, ambulance, or SES participants).

Prevalence and comorbidities of mental health conditions in emergency service workers

Of the 23 studies examining prevalence rates, seven (30%) were conducted in a police sample, four (17%) in an ambulance sample, five (22%) in a firefighter sample, and six (26%) conducted in a mixed sample of ESWs. One extra study included a mixed sample of ESWs, however reported individually on prevalence rates across police, ambulance, and firefighter members (Kyron et al., 2021). Across these studies, several types of health conditions have been examined and estimated at a range of prevalence rates (for a detailed list of studies allocated to category 1a, refer to Appendix C). In ambulance personnel, depression, anxiety, and PTSD, were common outcomes across studies. The prevalence rates of each condition varied across studies, ranging from 6.8% - 43.4% for depression, 5.7% – 20% for anxiety, and 5.4% – 18.9% for PTSD. Other conditions were also reported across studies including at risk alcohol use (60.5%), suicidal ideation (6.5%), stress (5.9% – 7.8%), and low wellbeing (26.7%). In firefighters, prevalence was reported for depression (13.7% – 17.7%), anxiety (11.6%), and PTSD (7.9%) as well as drinking habits (problem drinking [16.5% - 40%], binge drinking [40%], at risk drinking [61.1%]), suicidality (ideation [6.9 – 46.9%], plans [19.2%], attempts [15.5%], and self-injury [16.4%]), distress (8.2%), and low wellbeing (28.9%). Firefighter research has also highlighted prevalence rates of other health related conditions such as tobacco use (21%), musculoskeletal disorders (11%), and lower back pain (19.3%). Finally, studies utilising on police samples have investigated prevalence of similar outcomes including depression (9.8% – 50%), anxiety (8.5% - 16.1%), and PTSD (3.9% – 14.2%), as well as alcohol use (dependence [5%], hazardous drinking [2.9% - 25.7%], and at-risk drinking [60%]), suicidal ideation (4.7% - 8.5%), distress (9.9%), and low wellbeing (32.3%). In addition, police studies reported on rates of somatic health issues (chronic pain [39.8%], lower back pain [28.4% - 39.2%]), rates of suicide [11.78 – 20.6 suicides per 100,000 persons), and general health issues (41%). A number of studies have also examined prevalence rates of health conditions in mixed samples of ESWs. These studies have reported on

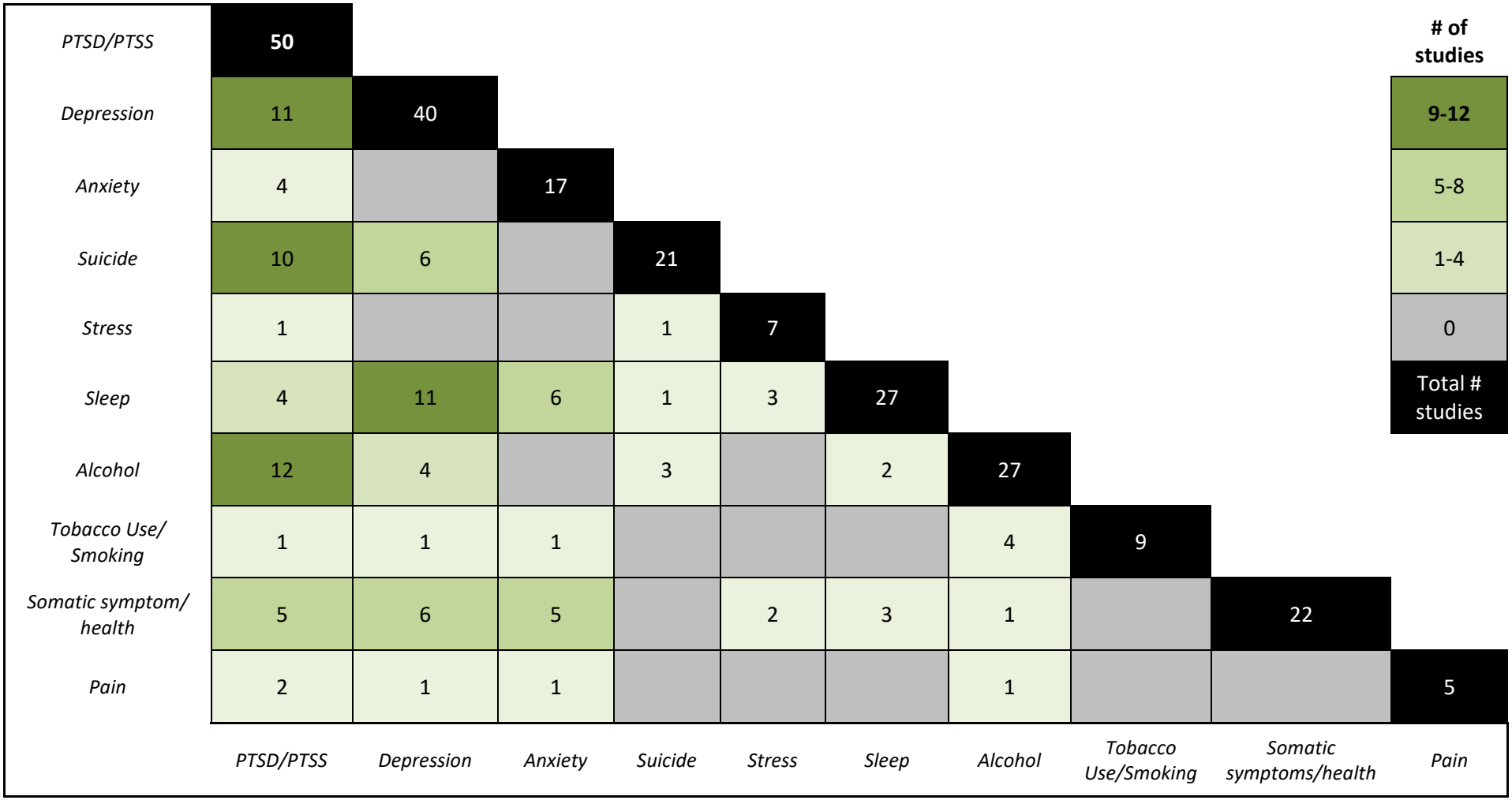
depression (6.8% – 26%), anxiety (3.9% – 18.12%), PTSD (9.2% - 22.3%), as well as alcohol issues (disorder [5.7%], consumption [32.8%]), panic disorder (8.2%), and suicides (7.8 – 22.4 suicides per 100,000 persons).

A larger proportion of studies have investigated comorbidities between health outcomes. Of the 73 studies reporting comorbidities, 20 studies (27%) were conducted in a police sample, four (6%) in ambulance personnel, 41 (56%) studies in firefighters, and eight (11%) studies included a mixed population of ESWs. Figure 1 presents the frequencies of comorbid associations between specific health conditions across studies. Note that as individual studies may include assessment of multiple comorbid conditions, some studies are represented in multiple cells. As shown in Figure 2, PTSD/PTSS, depression, sleep, and alcohol-related outcomes are the most frequently investigated comorbid conditions. Other less frequently reported outcomes include symptoms of anxiety, suicide, and somatic issues which were moderately represented, as well as outcomes reported across few studies such as stress, tobacco use/smoking, and pain.

Treatment studies conducted in emergency service workers with mental health conditions

Sixteen studies examined treatments for mental health conditions in ESWs (refer to Appendix D for a detailed list of identified treatment studies). Six of these studies were conducted in police (38%), five (31%) in firefighters, and five in a mixed sample of ESWs (31%). No studies were conducted exclusively among ambulance members. Several treatment types were identified, including first-line PTSD treatments (brief eclectic psychotherapy [2 x BEP], exposure based therapies [4 x PE], and narrative exposure therapy [1 x NET]); adjunctive treatments (compassion focussed therapy [CFT] combined with TF-CBT, MDMA pharmacotherapy with TF-CBT); mixed treatments ([a] imaginal exposure, behavioural activation, and cognitive therapy, [b] image rehearsal therapy and behavioural therapy for insomnia, and [c] EMDR, psychoeducation, stress reduction and relaxation techniques); and other treatment approaches (mindfulness based treatment approaches [2 x studies], and physical activity interventions [2 x studies]). Most treatment studies targeted symptoms of PTSD (13 studies; 81%) or depression (13 studies; 81%). Anxiety was a target of treatment in seven studies (44%), while other targets appeared in fewer than three studies (e.g., stress, sleep disturbances, alcohol misuse, quality of life, wellbeing, suicidality, posttraumatic growth, dissociative experiences, functioning, and return to work). In the majority of cases, treatments appeared effective overall, reducing target symptoms or improving psychological functioning (e.g., posttraumatic growth or wellbeing).

Figure 1. *The frequency of studies examining associations between specific health conditions reported across comorbidity research*.*



*As individual studies may include assessment of multiple couples of comorbid conditions, some studies are represented in multiple cells

Discussion

The primary aim of this review was to inform the development of a research agenda to guide prospective CoE research. To achieve this, we reviewed the available research literature on ESW mental health and examined the current landscape surrounding (1) the types of mental health conditions experienced by ESWs (including comorbidities), (2) treatment studies conducted in ESW populations, and (3) practitioner-related research relevant to treatment of mental health conditions in ESWs. The following sections discuss results relevant to each abovementioned categories, summarising findings across identified studies, highlighting gaps in previous ESW research, and outlining directions for future research. At the end of each section, a summary of key points and implications for the CoE is presented along with corresponding research questions derived from each discussion. These research questions are ultimately contextualised within an existing CoE research framework, together providing an overall agenda of prospective CoE research which can be used to guide the design, co-ordination, and implementation of ESW centric intervention and evaluation projects.

Prevalence and comorbidities of mental health conditions in emergency service workers

The three most common conditions in prevalence studies were PTSD, depression, and anxiety. Overall, the rates of PTSD ranged between 3.9% and 22.3%, while rates of depression and anxiety ranged between 6.8%-50% and 3.9%-20%, respectively. Although prevalence rates vary considerably between studies, overall, the prevalence of these conditions were comparable to those observed in other trauma-exposed populations, such as military personnel and combat veterans (Richardson et al., 2010; Thompson et al., 2006), but higher than rates in the general population (Atwoli et al., 2015; Creamer et al., 2001; Kessler et al., 2005; World Health Organization, 2017). In police and firefighter prevalence studies, additional mental health related conditions were reported including general psychological distress, suicidality, panic disorder, pain, musculoskeletal problems, and alcohol related problems. Ambulance-based prevalence studies reported primarily on rates of PTSD, depression, and anxiety, and lacked detail about other health conditions. Mixed sample studies include some of the additional mental health outcomes not reported in studies with ambulance worker samples alone, suggesting that many of these issues may present across all ESW roles, however, more research is needed to confirm this. Future research can benefit from assessment of a broader range of conditions across emergency service roles, and particularly ambulance workers, as

this would help characterise conditions which are shared between ESW roles and conditions that may be unique to specific roles. Future research can also extend beyond examination of typical ESW roles and include individuals in volunteer roles, or those who have transitioned out of uniformed ESW roles, to provide a more encompassing assessment of symptoms across emergency services more broadly. Such characterisations can better inform treatment providers about primary needs of patients in specific ESW roles, and assist generating role-sensitive approaches where required.

Studies examining comorbidities with mental health conditions reveal a complex interplay between conditions. Previous research in trauma-exposed populations has shown that mental health conditions rarely appear in isolation, and often co-occur with multiple other conditions (Trivedi et al., 2015). For example, in military veteran populations, PTSD has been associated with depression, alcohol misuse, and suicide (Nichter et al., 2019; Norman et al., 2018). Highly consistent findings were identified in this review, with PTSD-related associations with depression, suicide, and alcohol misuse most frequently reported. Associations between depression, sleep disturbance, alcohol misuse, pain, and physical health symptoms were also reported across several studies, consistent with previous research (Alexander et al., 2016; Bair et al., 2003; Conner et al., 2009; Simon et al., 1999). Reports of other highly comorbid symptoms typically reported in trauma-exposed populations, such as problem anger (Forbes et al., 2003a; Taft et al., 2017), were lacking in studies identified in this review. This finding suggests that the comorbid conditions identified in this review likely represent only a subset of the full range of comorbid symptom experience in ESWs, and emphasises a need for future research to examine a broader range of symptom experience in ESWs. Notwithstanding, the review findings emphasise the interconnectedness between mental health conditions in ESW samples, highlighting the potential for complex, multifaceted presentations of symptoms spanning multiple disorders. This is important to consider in the context of treatment, as the presence of comorbidities can influence treatment response, and reduce the effectiveness of clinical therapy (Forbes et al., 2003b; Kuyken & Tsivrikos, 2009; Lopez et al., 2019; Sripada et al., 2019). For example, comorbid symptoms have been found to reinforce each other generating cycles of mutual maintenance persisting across time (e.g., Kartal et al., 2021). Treating one symptom, or specific subset of symptoms, alone may therefore not fully address core processes underlying symptom presentation, and could result in reduced treatment efficacy, residual symptoms following treatment, or reappearance of symptoms following remission. This echoes the need for a broad assessment of symptom experience in ESWs receiving treatment (described above) to capture the range of comorbid symptoms likely to present in ESWs. Additionally, these findings highlight

utility in adopting multifaceted, personalised treatment approaches catering to unique profiles of symptoms experienced between individual patients (discussed in subsequent sections) or transdiagnostic therapies which attend to symptom profiles spanning multiple disorders (Hickie et al., 2019; McEvoy et al., 2009; Newby et al., 2015).

Key points:

- Given the high prevalence of PTSD, depression, and anxiety observed in ESWs, we expect high levels of these symptoms in presentations to the SNC. A major part of quality improvement outcome assessments should therefore include coverage across these symptom experiences.
- In addition to PTSD, depression, and anxiety, assessment of associated comorbid conditions should also be included, covering a range of symptom experiences including alcohol misuse, pain, sleep disturbance, suicidality, and anger.

CoE Research questions:

- What are the primary symptom profiles of ESWs seeking treatment through the SNC?
- Do we see improvements in PTSD, depression, and anxiety, in ESWs receiving treatment through the SNC?
- In addition to primary symptoms presenting in ESWs, is there resolution of comorbid symptom experiences in ESWs receiving treatment from the SNC?

Mental health treatment in emergency service workers

Just 16 treatment-focused studies were published, compared to at least 52 studies published in the same time period on other trauma-exposed populations investigating the effectiveness of interventions for PTSD alone (Lewis et al., 2020). Seven identified studies utilised first-line treatments for PTSD, and these were limited to three interventions: PE, NET, and BEP. The use of EMDR and TF-CBT were reported in another three treatment studies, however these were incorporated as part of adjunctive or mixed treatment approaches. Numerous other first-line treatments are yet to be examined in the ESW population, including cognitive processing therapy (CPT), cognitive therapy (CT), and written exposure therapy (WET). First-line treatments studies identified in this review all reported improved symptom experiences in ESWs, and have been effective in other trauma-exposed populations (Varker, Kartal, et al., 2021) , which suggest other first-line treatments may yield similar effects in ESWs.

Other treatment approaches identified in this review, including treatments grounded in physical activity or mindfulness-based meditation, as well as the adjunctive, or mixed treatment approaches mentioned above. These treatments demonstrated overall mental health symptom improvements and may be useful treatment options for ESWs. Consistent with previous research, the two mindfulness based studies showed utility in targeting symptoms of PTSD, depression, and anxiety (Australian Psychological Association, 2018). Likewise, physical activity treatments were effective in improving symptoms of PTSD, depression, and anxiety, as well as sleep, quality of life, pain, and alcohol misuse (McKeon et al., 2021; Rosenbaum et al., 2020). Caution is advised in interpreting these findings as although exercise based treatments have previously been shown to combat PTSD symptoms (Whitworth & Ciccolo, 2016), previous reviews cast doubt on the utility of exercise treatments to treat anxiety or depression (Krogh et al., 2017; Stonerock et al., 2015). Similarly, although adjunctive treatment studies identified in this review found positive effects on PTSD, depression, and anxiety symptoms (Beaumont et al., 2016; Mithoefer et al., 2018), recent research has highlighted limitations of treatment augmentation for improving PTSD symptoms (Metcalf et al., 2020). As such, the treatment modalities implemented in studies identified in this review provide some direction for effective treatment options for ESWs, however clinical application of such methods should be considered within the context of the broader research literature.

Although the evidence around specialised treatments for ESWs is limited, there are some early promising findings that point to the importance of ‘personalised medicine’ or ‘precision psychiatry’, with a focus on individualising treatment on the basis of unique symptom experience, rather than neurobiological differentiation (Fernandes et al., 2017; Gramlich & Neer, 2018). Personalised medicine approaches such as these are often extended to include comprehensive and systematic evaluation of patient symptoms before and/or between treatment sessions, referred to as ‘measurement-based care’ (MBC; Lewis et al., 2019; Scott & Lewis, 2015). For mental health practitioners, MBC enables greater oversight of patient progress and objective monitoring of symptom change across treatment; this is useful for alerting practitioners to lack of progress during treatment, and provides direction for adjustments to treatment according to patient needs (Sapyta et al., 2005). For patients, MBC encourages active involvement in the treatment process, and provides a better understanding of clinical decision making and personal symptom experience (Dowrick et al., 2009; Eisen et al., 2000). Together, these patient- and client-side factors have been tied to observed improvements in treatment outcomes when MBC is integrated into treatment (Bickman et al., 2011; Lambert et al., 2003; Morris & Trivedi, 2011). As such, the adoption of personalised- or MBC-type treatment

approaches, as well as the use of multifaceted interventions suited to individual symptom experience, represent an elegant means to accommodate the complexity of symptom presentation between patients (i.e., comorbidities), and a practical method to facilitate better treatment outcomes in ESWs receiving clinical care.

Another potential method for improving treatment outcomes exists through integrating contemporary digital technology into treatment practices (Huckvale et al., 2020). Recent research has demonstrated the effectiveness of digital interventions to improve mental health (Firth et al., 2017; Kerst et al., 2020) with some being applied in clinical settings (Hoffman et al., 2019). Despite ESWs expressing interest and openness to work with digital tools to manage mental health (Deady et al., 2017), no studies to date have incorporated technology into ESW clinical care. Only one study was identified in the process of conducting this review which utilised a smartphone application (app) to improve mental health in ESWs (van der Meer et al., 2020). This app (SUPPORT Coach), however, was not implemented in a clinical setting; rather the app was designed to assist self-management of trauma-related symptoms in a non-disordered sample of healthcare professionals which included paramedics and ambulance drivers. Digital technologies can be integrated into clinical care to improve treatment outcomes in a number of ways. For example, homework tasks have been identified as a key component of cognitive behavioural therapies which can be digitised to improve treatment impact via increased adherence, maintenance, and generalisation of therapeutic behaviours into daily life (Clough & Casey, 2015; Tang & Kreindler, 2017). Digital technology can also be leveraged as a medium through which to implement MBC. Health information technologies can be integrated into therapeutic practices by, for example, enabling comprehensive online assessments, collection real-time self-monitoring data via smartphone-based ecological-momentary-assessments (EMA), and regular patient reported outcome measure (PROMS; Davenport et al., 2019). Digital tools enabling such capacity capture a wealth of patient data which mental health practitioners can use to provide highly personalised care and service personalised needs of individual patients.

Treatment in ESWs may be further improved by considering a wider range of treatment outcomes that take a holistic view of recovery. The studies identified in this review primarily utilised traditional indices of mental illness to operationalise treatment outcomes (e.g., PTSD, depression, and anxiety). Researchers have emphasised that the absence of illness alone does not represent a complete state of mental health, and that mental health is best studied through combined assessments involving positive indices of mental functioning alongside traditional indices of mental illness (Keyes, 2005; Keyes, 2007). Recent research in trauma literature supports this notion demonstrating that although patients may show positive responses to

treatment via symptom reduction, such improvements may not extend to other aspects of functioning, such as quality of life, social relationships, physical health, and psychological distress (Hinton et al., 2021). Rather, to achieve outcomes indicative of an overall good end state, the magnitude of symptom reduction required lies below threshold for probable disorder, at which stage improvements can be observed in multiple functioning domains. As such, when conceptualising outcomes in terms of symptom reduction alone, it is crucial to assess other outcomes in parallel, to fully capture the degree of improvement across a broad spectrum of functioning.

An important outcome overlooked in the majority of studies identified in this review relates to patients' occupational health. As many ESWs seek professional treatment through employment assistance programs (EAPs), patients' capacity to return to work (RTW) following treatment is a priority concern. Additionally, being able to RTW is important as it provides a source of income and financial security for ESWs and their families, constitutes an important component of personal identity (Kronenberg et al., 2008), and has positive impacts on maintaining positive mental health functioning (Hoare & Machin, 2010; Nandi et al., 2004). Previous research suggests that many patients with mental health difficulties struggle to RTW despite receiving psychological treatment (MacDonald et al., 2003), and may not be any more likely to RTW relative to those not receiving treatment (Blonk et al., 2006). In contrast, the one treatment study identified in this review which included RTW as an assessed outcome, found that a considerable proportion of patients RTW following a 16-week course of BEP (Plat et al., 2013). Given the limited research conducted in ESWs treatment studies, explanation of inconsistent findings is difficult. One explanation is that unexamined, third-party factors may account for differences in the effectiveness of treatments for facilitating RTW outcomes. A variety of unexamined factors may be involved in predicting treatment outcomes, which may help explain differences in RTW to outcomes (e.g., treatment-, practitioner-, organisational-, patient-, or comorbid symptom level factors). Future research may be improved through greater inclusion of RTW outcomes following treatment (including longer term follow up investigations of ESW work life after treatment); this can help determine how effective treatments may be in improving occupational health and identify important factors which may facilitate or hinder achievement of occupation-related goals.

Another means of improving future treatment research is to apply the same logic to primary outcomes of treatment. In the current review, treatment studies assessed a variety of different outcomes (e.g., PTSD, depression, anxiety), and some studies included analysis of factors influencing such outcomes (e.g., age, gender, years working, comorbid conditions). Such findings are useful to understand which

individuals are more likely to respond, or not respond, to treatment. For example, some studies reported better treatment outcomes in male ESWs, ESWs reporting injury/maltreatment, or ESWs who had responded to a shooting (Boothroyd et al., 2019; Grupe et al., 2021; Smid et al., 2018), while more modest responses were seen in ESWs reporting private trauma involving a loss of a loved one (Smid et al., 2018). Such investigations can be extended in future research to examine influence of other factors including comorbid conditions (e.g., pain, alcohol misuse, sleep disturbances), organisational factors (e.g., support from senior staff or emergency service role), ESW role-specific factors (e.g., shift work or work-related violence), or individual perceptions of treatment (e.g., stigma). Findings of such investigations can be translated into clinical practice for treatment optimisation. For example, practitioners may strategize treatment planning differently for patients possessing characteristics associated with poor treatment response (e.g., implementing digital tools, conducting regular check-ups, providing more frequent treatment sessions, or using multifaceted treatment strategies). Findings could also be used to reduce hesitancy or barriers to seeking treatment reported among ESWs (Jones et al., 2020; Kyron et al., 2021). ESWs organisations may advertise mental health information to employees, highlighting key characteristics associated with favourable treatment responses, which may increase willingness among ESWs to seek or receive treatment among those matching such descriptions.

Key points:

- Prospective CoE research may benefit from examining the utility of personalised treatments by adopting measurement-based care as part of treatment delivery and quality improvement processes.
- Integration of digital technology can be a useful means to support treatment; investigating the utility of digital treatment tools can contribute towards developing robust and accessible treatment apps to support practitioners and patients.
- In addition to mental and physical health, it is important for SNC outcomes to also cover ESWs occupational health during, and after, treatment and assess return to work as a treatment outcome.
- CoE research should include investigation of individual factors which influence treatment outcomes to better understand mechanisms of symptom change across time.

Research questions:

- What is the feasibility and acceptability of digital health tools to assist with treatment delivery (e.g., via digital measurement-based care or digitised homework tasks)?
- What are the rates of return to work in ESWs receiving treatment through the SNC?
- How do comorbid conditions impact treatment and influence treatment outcomes?

Practitioner-related research relevant to treatment of mental disorders in emergency service workers

No practitioner-related research was identified in the current review, highlighting a key gap in ESW research literature and opportunity for future research. Mental health practitioners represent an integral and modifiable component of the treatment process which may contribute to differences in treatment outcomes (Kim et al., 2006; Lutz et al., 2007; McKay et al., 2006; Wampold & Brown, 2005). Previous research has shown that specific practitioner-related characteristics predict better treatment outcomes, including practitioners' emphasis on building a strong therapeutic relationship (Vocisano et al., 2004), competence of individual therapists (Davidson et al., 2004; Kuyken & Tsivrikos, 2009), and therapist adherence to treatment protocols (Hogue et al., 2008). A range of other practitioner-related factors are likely to exist, and some may have explicit relevance to ESWs. One example of this relates to cultural competencies of mental health practitioners treating ESWs (Tseng & Streltzer, 2008). Cultural competency is an important component of psychotherapy (Anderson et al., 2019), highly valuable for provision of competent clinical services (Reger et al., 2008). Emergency service occupations often maintain unique work-place cultures due to the nature of their work environments (Paoline, 2003; Woody, 2005), and these have notable implications for treatment. For example, ESW culture often entails demarcation between ESWs and the general population; this distinction can arise from their need to rely on one another in dangerous situations and shared experiences of work, which often times must remain confidential from family and friends (Kronenberg et al., 2008). ESWs may consequently withdraw from family and friends, in favour of their own occupational communities, which can develop into guardedness or mistrust of non-ESWs, including treating mental health practitioners (Kronenberg et al., 2008; Woody, 2005). Work-place cultures may also include a variety of other different features including specific vernacular, expectations for conduct and behaviour, belief systems, identity, standards of appearance and dress, specific symbols, rituals, acronyms, and general understandings of working in the occupation (Hall, 2013). Although not all of these may be relevant to ESWs, appropriate awareness of individual ESW cultures (including mental health impacts of transitioning out of these roles) may be critical for developing trust and rapport with patients, and to establish healthy therapeutic alliances in order to achieve treatment goals. Practitioner-related outcomes, such as practitioners' cultural competencies, have yet to be examined in clinical treatment of ESW and represent a gap in the research literature worthy of investigation. The information gathered from such research can be used to inform specialised clinical training

of mental health practitioners for treating emergency service workers to improve treatment delivery and improve mental health outcomes.

Practitioners also possessed a wealth of information and first-hand experience providing clinical treatment which can be explored to develop new and innovative ways to improve treatments. Practitioners can be invited as part of experience-based co-design (EBCD) to provide insights about their views, perspectives, and experiences treating ESWs (Bate & Robert, 2006; Robert, 2013). EBCD is a collaborative technique that aims to improve healthcare services by enabling relevant stakeholders (service users, staff, administration, developers, management, etc.) to work together and design better services. While EBCD often focuses on service users to shape better treatments (Bevan Jones et al., 2020; Hodson et al., 2019; Rickard et al., 2016), they can also involve practitioners who deliver treatment. For example, mental health practitioners have been invited to participate in co-design studies to provide feedback regarding integration of technology into therapeutic practices (Sundram et al., 2017). Similarly, co-design studies have been conducted with practitioners to better understand the opportunities and considerations surrounding implementation of new technologies in specific treatment modalities or patient cohorts (How et al., 2017). No studies were identified in the process of conducting this review that implemented co-design methods among practitioners working with ESW patients. Co-design studies can be used to explore potential needs of practitioners or to identify new opportunities for treatment improvement. The information garnered from such studies can inform development of materials to accommodate practitioner needs and direct future research towards new exploring new ways to maximise treatment efficacy.

Key points

- Cultural competencies of mental health practitioners are highly relevant in the context of treating ESWs, and little research has been conducted examining its effects on treatment outcomes
- Co-design represents a useful means to collaborate with practitioners to identify ways to improve treatment. CoE research may benefit from conducting experience-based co-design studies to assess the utility, acceptability, and relevance of integrating digital tools into treatment

Research questions:

- Can we devise an assessment of cultural competency of practitioners working with ESWs?
- How do practitioners' cultural competency influence ESW treatment outcomes?
- For mental health practitioners, what are the most important ways digital tools could help with treatment delivery in ESWs?

Conclusion

Mental health is as priority issue for ESWs with increasing recognition of the psychological impacts of repeated workplace trauma and stressors related to emergency occupations. This review examined the research literature relating to ESW mental health to identifying gaps in existing research and recognise opportunities to conduct studies that contribute toward improving mental health outcomes for ESWs. Findings of this review include a series of key points to consider in the design of future studies, and we have derived a range of corresponding research questions to inform the CoE research agenda and guide prospective CoE research.

The key points identified in this review highlight the importance of assessing PTSD, depression, and anxiety as primary mental health conditions across emergency service roles, as well as several other co-occurring conditions including suicidality, alcohol related problems, sleep disturbances, and pain. Review findings also emphasise the potential utility of adopting models of 'personalised medicine' or MBC which can be used to design treatments according to individual patient needs across the course of treatment. Treatments may also be extended to integrate digital technology into clinical practice by, for example, facilitate an online system of MBC or digitising homework tasks to increase treatment adherence and generalisation. Findings of this review also discuss the importance of including more holistic assessments of treatment outcomes beyond indices of mental illness alone, to incorporate other meaningful outcomes such as capacity to return to work. Additionally, future research may also benefit from more detailed explorations of factors which may influence treatment outcomes to better understand mechanisms of treatment response, and facilitate identification of characteristics or treatment contexts conducive to non-response. Finally, review findings highlight opportunity for future research to engage mental health practitioners in ESW research to examine practitioner-related variables (e.g., cultural competency) influencing treatment outcomes, or to engage practitioners using co-design methods to gather contemporary, professional, and experienced perspectives about ways to improve treatment of mental health conditions in ESWs.

The individual research questions derived from findings can be contextualised across outcome domains of the CoE research framework. Together, the framework and associated research questions provide a roadmap for prospective CoE research, and this can be used as a guide for the design, co-ordination, and development of future ESW studies. The framework and associated research questions are presented below.

	Outcome Domain				
Domain of Functioning	***CoE Research Framework***	**Population:** *Understanding mental health outcomes in emergency service workers*	**Practitioner:** *Investigating preparedness and competency of practitioners*	**Treatment innovation:** *Developing and testing innovations in mental health treatment*	**Quality improvement:** *Evaluating and improving the quality of treatment provided by the SNC*
	Physical health	What are the primary symptom profiles of ESWs seeking treatment through the CoE?	How do practitioners' cultural competency influence ESW treatment outcomes? For mental health practitioners, what are the most important ways digital tools could help with treatment delivery in ESWs? Can we devise an assessment of cultural competency of practitioners working with ESWs?	What is the feasibility and acceptability of digital health tools to assist with treatment delivery via: • digital measurement-based care • digital treatment homework tasks	Do we see improvements in PTSD, depression, and anxiety, in ESWs receiving treatment? Is there resolution of comorbid symptom experiences in ESWs receiving treatment? How do comorbid conditions impact treatment and influence treatment outcomes? What are the rates of return to work in ESWs receiving treatment?
	Mental health				
	Social health				
	Occupational health and functioning				

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Appendix A

A broad search strategy was developed and implemented to capture available evidence surrounding ESW mental health. Resultant data underwent multiple rounds of screening to identify relevant studies; studies were first screened according to a broad inclusion and exclusion criteria for general inclusion in the study, before being screened a second time for specific sorting into relevant categories for review and synthesis. Categories reflected key aims of the study, including (1) the prevalence of primary mental health conditions and comorbidities in ESWs, (2) the treatment of mental health disorders in ESWs, and (3) practitioner-focussed research surrounding treatment of ESWs with mental health disorders.

Search strategy

To identify relevant research studies, a search was conducted in PsychINFO, EMBASE, MEDLINE, and the Cochrane Library (randomized control trials, as well as systematic reviews, registries) databases. Search terms were developed in consultation with experts in trauma research, and included: ('police', 'policeofficer*', 'police officer*', 'police-officer*', 'policem*n', 'policewom*n', 'firefighter*', 'fire fighter*', 'fire-fighters*', 'fire service* personnel', 'firem*n', 'response worker*', 'emergency worker*', 'emergency service* worker*', 'emergency services* personnel', 'ambulance worker*', 'ambulance service* worker*', 'ambulance personnel', 'ambulance', 'ambulance service*', 'state emergency service*') AND ('mental health', 'depress*', 'anxi', 'PTSD', 'post-trauma*', 'post trauma*', 'post-trauma*', 'suicid*', 'mental illness', 'mental disorder'). The search was restricted to studies published in the last 10 years, published in a journal, peer-reviewed journal, book, or edited book, and published in the English language.

Inclusion and exclusion criteria

To be included studies were required to meet the following criteria: (1) the study sample comprised an ESW population (e.g., firefighter, police, ambulance or SES related roles), (2) the primary focus of the study concerned the mental health of ESWs, and (3) studies present complete original research (empirical study or literature review). Commentaries, conference abstracts, book chapters, and editorials were excluded.

Screening and categorisation

Titles and abstracts of eligible studies were screened and categorised according to the three primary areas of focus for this review. Specific parameters were established to guide categorisation of included studies. Studies deemed unrelated to parameters were excluded.

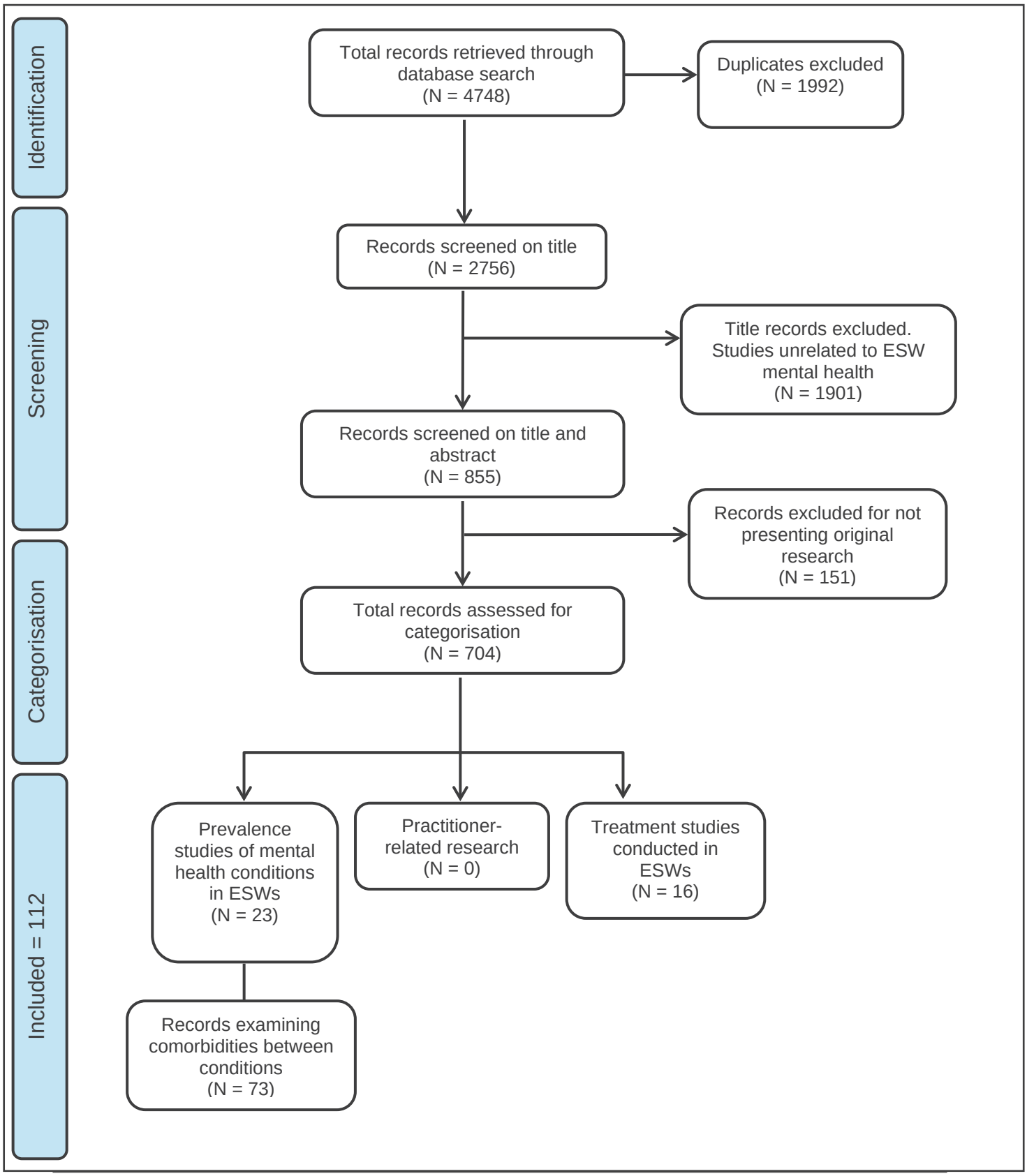
Parameters for sorting studies into categories reflecting primary aims of the study.

Aim/Category	*Categorisation parameter*
4. Types of mental health disorders experience by ESWs	c) Studies reporting on the prevalence rates of mental health disorders in ESW sample >800 participants using either an empirical or review-based methodology. d) Studies examining associations between mental health disorders and other health conditions in ESWs
5. Treatment studies conducted in ESW populations	b) Studies describing treatment of mental health symptoms in ESW populations
6. Practitioner-related research relevant to treatment of mental health disorder in ESWs.	b) Studies including assessment of mental health outcomes as a result of any practitioner-related variable.

Studies were included if they pertained to ESWs health in the context of their day-to-day employment. Studies examining outcomes in response to large-scale single-incident disaster such as a terrorist attack, natural disaster, or pandemic were excluded. As the primary purpose of this study is to survey the current landscape of research literature pertaining to mental health and wellbeing of ESWs with respect to key CoE objectives, the current review did not aim to appraise or describe any research findings in exhaustive details outside the study aims (Hetrick et al., 2010).

Appendix B

Figure 2. *Flow chart of search for studies*



Appendix C

Table 3. *Research studies examining the prevalence of mental health related conditions in emergency service workers.*

Author (year)	*Country*	*Study type (N)*	*Measures*	*Outcomes (% prevalence of disorder, or probable disorder, in study sample)*
Ambulance/paramedics/EMT				
Eiche et al. (2019)	*DEU*	*Prevalence study (2,684)*	*Depression (WHO-5)* *PTSD (short screening scale for DSM-IV PTSD)*	*Depression (43.4%)* *PTSD (5.4%)*
Petrie et al. (2018)	*N/A*	*Review*	*N/A*	*PTSD (11%*)* *Depression (15%*)* *Anxiety (15%*)* *Psychological Distress (27%*)*
Wagner et al. (2020)	*N/A*	*Review*	*N/A*	*PTSD (18.9%*)* *Depression (20.6%*)* *Anxiety (20%*)*
Bentley et al. (2013)	*USA*	*Prevalence study (34,340)*	*Depression, Anxiety, Stress (DASS-21)*	*Depression (6.8%)* *Anxiety (5.7%)* *Stress (5.9%)*
Kyron et al. (2021)	*AUS*	*Prevalence study (3473)*	*PTSD (PCL)* *Wellbeing (SWEMWBS)* *Psychological distress (K10)* *Suicide (experimenter items)* *Alcohol (Audit-C)*	*PTSD (8.9%)* *Depression (16%)* *Anxiety (13.8%)* *Any condition (22.1%)* *Alcohol (at risk, 60.5%)* *Suicidal ideation (6.5%),* *Very high distress (7.8%)*

Firefighters				
Jitnarin et al. (2015)	*USA*	*Prevalence study (947)*	*Tobacco use (experimenter authored items)*	*Tobacco use (21%)*
Kim et al. (2013)	*KOR*	*Prevalence study (21,466)*	*MSD (NIOSH), Dep (CES-D), Problem drinking (Audit)*	*MSD (11%), Dep (17.7%), Problem drinking (40.8%)*
Kim et al. (2017)	*KOR*	*Prevalence study (24,029)*	*Lower back pain (NIOSH)*	*Lower back pain (19.3%)*
Stanley et al. (2015)	*USA*	*Prevalence study (1,027)*	*Suicidality (SITB-SF)*	*Ideation (46.8%)* *Plans (19.2%* *Attempts (15.5%)* *Self-injury (16.4%)*
Haddock et al. (2017)	*USA*	*Prevalence study (1,913)*	*Alcohol use (experimenter authored items)*	*Binge drinking (40%)* *Problem drinking (16.5%)*
Kyron et al. (2021)	*AUS*	*Prevalence study (2975)*	*PTSD (PCL)* *Wellbeing (SWEMWBS)* *Psychological distress (K10)* *Suicide (experimenter items)* *Alcohol (Audit-C)*	*PTSD (7.9%)* *Depression (13.7%)* *Anxiety (11.6%)* *Any condition (18.0%)* *Alcohol (at risk, 61.1%)* *Suicidal ideation (6.9%)* *Very high distress (8.2%)* *Low wellbeing (28.9%)*

Police				
Syed et al. (2020)	*N/A*	*Review*	*N/A*	*Depression (14.6%*)* *Anxiety (9.6%*)* *PTSD (14.2%*)* *Alcohol dependence (5.0%*)* *Hazardous drinking (25.7%*)* *Suicidal ideation (8.5%*)*
Douma et al. (2019)	*CAN*	*Prevalence study (3,589)*	*Lower back pain (Nordic Musculoskeletal Questionnaire)*	*Chronic pain (39.8%), Acute/subacute LBP (39.2%), Chronic LBP (28.4%)*
Grassi et al. (2019)	*ITA*	*Prevalence study (Suicides, 1995 – 2017)*	*Suicide (age-adjusted suicide rate, per 100,000)*	*Suicide (11.78, per 100k)*
Irizar et al. (2021)	*GBR*	*Prevalence study (23,826)*	*PTSD (TSQ), Alcohol (drinks diary)*	*PTSD (3.95%)* *Harmful Alcohol use (2.9%)*
Stevelink, Opie, et al. (2020)	*GBR*	*Prevalence study (40,299)*	*Depression (PHQ)* *Anxiety (HADS-A)* *PTSD (TSQ)*	*Depression (9.8%)* *Anxiety (8.5%)* *PTSD (3.9%)*
Costa et al. (2019)	*PRT*	*Prevalence study (Suicides, 2005 – 2014)*	*Suicide (age-adjusted suicide rate, per 100k)*	*Suicide (20.6, per 100k)*
Black et al. (2013)	*IRL*	*Prevalence study (972)*	*Depression (BDI)* *PTSD (MPSS-SR)* *General Health (GHQ-12)*	*Depression (50%)* *PTSD (27%)* *General health issues (41%)*

Kyron et al. (2021)	*AUS*	*Prevalence study (8088)*	*PTSD (PCL)* *Wellbeing (SWEMWBS)* *Psychological distress (K10)* *Suicide (experimenter items)* *Alcohol (Audit-C)*	*PTSD (9.9%)* *Depression (16.3%)* *Anxiety (16.1%),* *Any condition (23.2%)* *Alcohol (at risk, 60.6%)* *Suicidal ideation (4.7%)* *Very high distress (9.9%)* *Low wellbeing (32.3%)*
Mixed sample (includes any combination of police, ambulance, firefighters, or SES within the studied sample)				
Berger et al., 2012	*N/A*	*Review*	*N/A*	*PTSD (10%*)*
Carleton et al. (2018)	*CAN*	*Prevalence study (5,093)*	*Pain (experimenter authored items)* *PTSD (PCL)* *Depression (PHQ)* *Anxiety (GAD)* *Panic disorder (PDSS-SR)* *Alcohol (AUDIT)*	*PTSD (22.3%)* *Depression (26%)* *Anxiety (18.12%)* *Panic disorder (8.2%)* *Alcohol use disorder (5.7%)* *Any disorder (38.58%)*
Milner et al. (2017)	*AUS*	*Prevalence study (Suicides, 2001 – 2012)*	*Suicide (age-adjusted suicide rate, per 100,000)*	*Suicide males (22.4, per 100k Suicide females (7.8, per 100k)*
Stanley et al. (2016)	*USA*	*Prevalence study (Suicides, 1993 – 2014)*	*Suicide (age-adjusted suicide rate, per 100,000)*	*Suicide (11.61, per 100k)*
Stevelink, Pernet, et al. (2020)	*GBR*	*Prevalence study (842)*	*Depression (PHQ9)* *Anxiety (GAD7)* *PTSD (PCL-6)* *Alcohol (AUDIT)*	*Depression (6.8%)* *Anxiety (3.9%)* *PTSD (9.2%)* *Alcohol (32.8%)*
Vigil et al. (2021)	*USA*	*Prevalence study (Suicides, 1993,2003-2004, 2007-2013)*	*Suicide (Proportionate Morality Ratio)*	*Firefighters (PMR = 172)* *EMT (PMR = 124)*

Note, Kyron et al. (2021) reported on prevalence rates of specific roles in a single study and is therefore represented across multiple rows in the table.

*pooled prevalence rate calculated across multiple studies included in review

Appendix D

Table 4. *Research studies reporting on the treatment of mental health conditions in emergency service workers.*

Author, year	*Country*	*Sample characteristics*	*Treatment Type*	*Treatment target*	*Outcome*
Police					
Rosenbaum et al. (2020)	*AUS*	*60 Police officers* *80% traumatic stress dx* *47% depression dx*	*RECONNECT exercise program*	*PTSD* *Depression* *Anxiety* *Stress* *Sleep* *Alcohol*	*Clinically significant reductions in PTSD, depression, anxiety, and stress were observed at the midway and post-intervention assessments, as compared to baseline.*
Smid et al. (2018)	*NLD*	*665 Police officers* *100% PTSD dx*	*Brief eclectic psychotherapy*	*PTSD*	*Significant reduction in PTSD symptoms at post-intervention assessment, as compared to baseline.*
Trombka et al. (2021)	*BRA*	*170 civil police and civil guard*	*Mindfulness based health promotion*	*Depression* *Anxiety* *Quality of life*	*Mindfulness intervention group showed significant reductions in depression and anxiety symptoms, and significant increases in quality of life at post-treatment and 6-month follow up, as compared to the waitlist control group.*
Grupe et al. (2021)	*USA*	*30 Police officers (non-command)*	*Mindfulness training program*	*PTSD* *Depression* *Anxiety* *Stress* *Sleep* *Wellbeing*	*Following completion of the 8-week training program, police officers showed significant reductions in PTSD and anxiety symptoms, as well as significant improvements in sleep and wellbeing, at training completion. Reductions in PTSD and anxiety symptoms were maintained at 5-months follow up.*
Peres et al. (2011)	*BRA*	*36 Police officers* *100% partial PTSD*	*Exposure-based therapy and cognitive restructuring*	*PTSD* *Depression* *Anxiety*	*Police officers receiving treatment achieved significant reductions in PTSD symptoms and anxiety symptoms, but not depressive symptoms. Policemen in the waitlist and healthy control groups showed no significant reductions.*
Plat et al. (2013)	*NLD*	*121 Police officers* *100% PTSD dx*	*Brief eclectic psychotherapy*	*Return to work*	*Following treatment completion, 81% of personnel who were on sick leave at intake returned to work. These participants returned to work at 87% of their original hours.*

Firefighters					
Beaumont et al. (2016)	*GBR*	*17 firefighters referred to therapy following a traumatic incident*	*TF-CBT (w/ adjunct compassion therapy)*	*PTSD Depression Anxiety*	*Both the TF-CBT and the TF-CBT (w/ adjunct compassion therapy) demonstrated significant reductions in depressive, anxious, and PTSD symptoms (hyperarousal, intrusion, and avoidance).*
Gramlich and Neer (2018)	*USA*	*1 firefighter-paramedic w/ PTSD and depression dx*	*Mixed intervention with imaginal exposure, behavioural activation, and cognitive therapy for depression*	*PTSD Depression*	*The clinical case study demonstrated a loss of PTSD and depression diagnosis at 2-months follow up. The patient also demonstrated significant reductions in horrific images symptoms (intrusion symptoms).*
Zwetzig et al. (2021)	*USA*	*2 firefighters w/ PTSD*	*Prolonged exposure (massed)*	*PTSD Depression Suicidality*	*Both patients demonstrated clinically relevant reductions in PTSD and depressive symptoms, and reductions in suicidal ideation, at post-treatment and 1-month follow up.*
Alghamdi et al. (2015)	*SAU*	*34 firefighters w/ PTSD*	*Narrative Exposure Therapy*	*PTSD Depression Anxiety*	*The intervention group achieved significantly greater reductions in symptoms of PTSD, anxiety, and depression, as compared to the waitlist group following treatment completion.*
Jang et al. (2020)	*KOR*	*39 firefighters*	*Firefighter's Therapy for Insomnia and Nightmares (Image rehearsal therapy + Behaviour therapy for insomnia)*	*PTSD Depression Suicidality Sleepiness Insomnia Nightmares*	*Following completion of the intervention, participants showed significant improvements across a range of sleep indices (e.g., nightmares, insomnia, sleep efficiency, etc.), and significant reductions in PTSD and depressive symptoms*

Mixed sample (includes any combination of police, ambulance, firefighters, or SES within the studied sample)					
Boothroyd et al. (2019)	*USA*	*207 first responders exposed to a traumatic event*	*Operation Restore (Mix of EMDR, psychoeducation, stress reduction techniques, and relaxation)*	*Posttraumatic growth*	*Significant growth was observed in all domains of posttraumatic growth following participation, and these yielded large effect sizes*
Bryant et al. (2019)	*AUS*	*100 Emergency service personnel w/ PTSD*	*Brief and Long CBT based exposure therapy*	*PTSD Depression*	*Participants in either the brief or long CBT based exposure therapy groups achieved significantly greater reductions in PTSD and depressive symptoms as compared to the waitlist group.*
Golden et al. (2014)	*USA*	*1 first-responder w/ PTSD*	*Prolonged exposure*	*PTSD Depression*	*Over the course of treatment, the patient showed decreases in depressive symptoms and all PTSD symptom (intrusions, avoidance, and hyperarousal)*
McKeon et al. (2021)	*AUS*	*12 first-responders assessed as 'physically inactive'*	*Physical activity intervention*	*PTSD Depression Anxiety Sleep Quality of life Pain*	*At post-intervention first responder participants showed significant reductions in psychological distress as well as depressive and anxious symptoms. No significant differences were observed in PTSD symptoms, sleep issues, or pain.*
Mithoefer et al. (2018)	*USA*	*26 emergency service personnel w/ chronic PTSD*	*MDMA assisted TF-CBT*	*PTSD Depression Sleep Posttraumatic Growth Dissociative experiences Functioning*	*After two experimental sessions with MDMA, participants receiving 75mg and 125mg of MDMA + psychotherapy showed significant reductions in PTSD symptoms, sleep symptoms, dissociative symptoms, as well as significant increases in posttraumatic growth, and general functioning. A significant decrease was also observed in depressive symptoms for the 125mg + psychotherapy group only.*