



A systematic review of the usefulness of pre-employment and pre-duty screening in predicting mental health outcomes amongst emergency workers

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ABSTRACT

Despite a lack of proven efficacy, pre-employment or pre-duty screening, which alleges to test for vulnerability to PTSD and other mental health disorders, remains common amongst emergency services. This systematic review aimed to determine the usefulness of different factors in predicting mental disorder amongst emergency workers and to inform practice regarding screening procedures. Systematic searches were conducted in MEDLINE, PsycINFO and EMBASE to identify cohort studies linking pre-employment or pre-duty measures in first responders with later mental health outcomes. Possible predictors of poor mental health were grouped into six categories and their overall level of evidence was assessed. Twenty-one prospective cohort studies were identified. Dynamic measures including physiological responses to simulated trauma and maladaptive coping styles (e.g. negative self-appraisal) had stronger evidence as predictors of vulnerability in first responders than more traditional static factors (e.g. pre-existing psychopathology). Personality factors (e.g. trait anger) had moderate evidence for predictive power. Based on the evidence reviewed, however, we are unable to provide emergency services with specific information to enhance their current personnel selection. The results indicate that pre-duty screening protocols that include personality assessments and dynamic measures of physiological and psychological coping strategies may be able to identify some personnel at increased risk of mental health problems. However, further longitudinal research is required in order to provide meaningful guidance to employers on the overall utility of either pre-employment or pre-duty screening. In particular, research examining the sensitivity, specificity and positive predictive values of various screening measures is urgently needed.

1. Introduction

Mental disorders are now the leading cause of sickness absence in most developed countries (Black, 2008; Cattrell et al., 2011; Harvey et al., 2009; Murray et al., 2012). The impact is particularly great amongst a number of high-risk occupations, such as emergency service workers, where repeated exposure to distressing or traumatic incidents can have a range of adverse mental health outcomes (Harvey et al., 2015). Recent estimates suggest that up to 10% of first response emergency workers may be suffering from post-traumatic stress disorder (PTSD) (Berger et al., 2012), with similar numbers reporting other trauma-related mental health disorders, such as depression.

While such figures highlight the increased risk associated with emergency service work, they also demonstrate that even amongst this trauma-exposed group only a minority will develop PTSD or other long-term mental health problems (Bryant and Guthrie, 2007). This raises the question of whether it is possible to predict which individuals will be resilient to the cumulative trauma exposure that occurs with emergency service work. Pre-employment screening is carried out by many emergency services in the hope of identifying pre-morbid predictors for mental health disorder in order to reduce the cost of absenteeism, but there remains surprisingly little evidence regarding its effectiveness or any useful information to guide this process.

Epidemiological research with the general population (Kessler

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et al., 1995), and studies of other high-risk groups such as disaster victims (Shore et al., 1986), Vietnam veterans (Green et al., 1990), and victims of crime (Resnick et al., 1993), have shown that predisposing factors for PTSD can be reliably identified. Risk factors identified from prospective studies in other groups include existing psychopathology, childhood trauma, personality characteristics such as introversion and neuroticism, and maladaptive coping strategies such as heavy alcohol use (Davidson and Foa, 1993). However, when pre-exposure screening has been attempted in high-risk work situations, for example amongst military personnel prior to overseas deployment, the results have been mixed. Within the UK military, prospective studies have found that while there it is possible to identify those at increased risk, screening on the basis of pre-exposure symptoms levels was not helpful in predicting subsequent psychological morbidity (Rona et al., 2006). In contrast, controlled studies undertaken in the US military have found pre-deployment screening was associated with reduced mental health problems (Warner et al., 2011b). A systematic review of pre-employment physical health screening across a variety of civilian occupational settings found that questionnaire based assessments had either no or very weak ability to predict a variety of health and work outcomes (Madan and Williams, 2012).

Concerns regarding the use of pre-employment screening go further than a lack of proven efficacy. Even if a pre-employment screen is able to identify workers who are at increased risk, there will be variations in the positive predictive value of any measure or group of measures. As a result, any pre-employment test used to exclude candidates being offered a position will mean some individuals who would have remained healthy will miss out on potential career opportunities.

In spite of a lack of proven efficacy, pre-employment screening which alleges to test for vulnerability to mental disorder remains common amongst emergency service and first responder organisations. Establishing which, if any, pre-employment screening measures are reliably able to predict mental health outcomes amongst emergency service workers is an essential first step in deciding whether the benefits of pre-employment testing outweigh the potential risks and costs.

The aim of this systematic review is to determine the effectiveness of pre-employment or pre-duty screening as predictors of mental disorder amongst emergency service workers. While we considered all mental disorders in this systematic review, given that depression, anxiety, adjustment disorders and post-traumatic stress disorders are known to be the most prevalent mental disorders amongst emergency workers, we focused particularly on studies measuring these outcomes. To the best of our knowledge this is the first systematic review of pre-employment screening in the emergency services.

2. Methods

2.1. Search strategy

Systematic searches were conducted in MEDLINE, PsycINFO and EMBASE electronic databases. A comprehensive range of subject headings and key words combining emergency personnel (e.g. firefighters, police officers, paramedics, first responders), pre-employment screening or risk prediction measures, mental health outcomes and prospective study design were devised for each database (see [Supplementary Table 1](#) for the full search strategy).

2.2. Inclusion criteria

The criteria for full text articles to be included in this systematic review were:

- Prospective cohort studies linking baseline pre-employment or pre-duty screening data with mental health outcomes, and;
- Use of validated mental health outcome measures, specifically for

depression, anxiety, adjustment disorders and post-traumatic stress disorder (PTSD), and;

- Participants were first responders or emergency personnel (police officers, firefighters and paramedics), and;
- Minimum follow-up of four weeks, and;
- Published in the English language.

2.3. Selection process

Two researchers (RM and JM-S) independently analysed each title and abstract identified by the above search strategy in order to exclude papers which were either duplications or did not meet the inclusion criteria. Of the remaining studies, the full text was obtained in order to establish relevance. Any indecision regarding a study's inclusion was referred to a third senior researcher (SBH) for consideration. The reference lists of all the included articles were then scrutinised in order to identify any research publications not previously captured. Finally, a senior author search (utilising the senior author of each included article) was conducted to find any other studies which met the inclusion criteria.

2.4. Quality assessment of the studies

Included studies were assessed for their methodological quality using the Newcastle-Ottawa Scale (NOS) for cohort studies (Wells et al., 2000). Each paper was awarded a score out of nine given compliance on a number of criteria, including representativeness of the exposed cohort, selection of the non-exposed cohort, ascertainment of exposure, comparability of the cohorts on the basis of the design or analysis and assessment of outcome, methods used and adequacy of follow up. As a number of the factors measured could be influenced by existing symptom severity (e.g. coping mechanisms or personality measures may be altered by the presence of existing mental health symptoms), care was taken to assess how researchers controlled for potential confounders. Studies receiving a score of seven or above were considered to be of 'high' quality, those scoring four to six graded as 'adequate' quality, and those receiving a score of three or less considered 'weak'.

2.5. Overall strength of evidence ratings

In addition to rating the quality of each individual study included, the overall level of evidence for each category of risk factors considered was also estimated. This was done using a modified version of the Royal College of General Practitioners (RCGP) star rating system. As outlined in [Table 1](#), four levels of evidence were defined based on the amount and quality of observational data found; strong evidence, moderate evidence, limited or contradictory evidence and inconclusive evidence.

Table 1
Definitions of overall levels of evidence ratings used in this review.

Levels of Evidence	Definition
★★★ Strong Evidence	Consistent findings of significant predictive power from multiple cohort studies of high quality
★★ Moderate Evidence	Reasonably consistent findings, but without universal agreement, from multiple cohort studies of high or adequate quality.
★ Limited or Contradictory Evidence	Mixed or inconsistent evidence from multiple cohort studies of various quality
? Inconclusive Evidence	Inconclusive findings from adequate or weak cohort studies

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