



## Original Article

## Psychological Distress and Pain Reporting in Australian Coal Miners



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## ABSTRACT

**Background:** Coal mining is of significant economic importance to the Australian economy. Despite this fact, the related workforce is subjected to a number of psychosocial risks and musculoskeletal injury, and various psychological disorders are common among this population group. Because only limited research has been conducted in this population group, we sought to examine the relationship between physical (pain) and psychological (distress) factors, as well as the effects of various demographic, lifestyle, and fatigue indicators on this relationship.

**Methods:** Coal miners ( $N = 231$ ) participated in a survey of musculoskeletal pain and distress on-site during their work shifts. Participants also provided demographic information (job type, age, experience in the industry, and body mass index) and responded to questions about exercise and sleep quality (on- and off-shift) as well as physical and mental tiredness after work.

**Results:** A total of 177 workers (80.5%) reported experiencing pain in at least one region of their body. The majority of the sample population (61.9%) was classified as having low-level distress, 28.4% had scores indicating mild to moderate distress, and 9.6% had scores indicating high levels of distress. Both number of pain regions and job type (being an operator) significantly predicted distress. Higher distress score was also associated with greater absenteeism in workers who reported lower back pain. In addition, perceived sleep quality during work periods partially mediated the relationship between pain and distress.

**Conclusion:** The study findings support the existence of widespread musculoskeletal pain among the coal-mining workforce, and this pain is associated with increased psychological distress. Operators (truck drivers) and workers reporting poor sleep quality during work periods are most likely to report increased distress, which highlights the importance of supporting the mining workforce for sustained productivity.

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## 1. Introduction

Increasingly companies are striving to support not only the physical safety of their employees, but also their psychological safety [1]. In part, this is driven by the high costs associated with psychological injuries, which tend to be higher due to increased periods of absence and higher medical, legal, and other claim payments [2,3]. Along with absenteeism, another key area of productivity cost is presenteeism [4]. Presenteeism, which also involves high cost, occurs when employees continue to attend work rather than be absent, as a result of which their productivity suffers [5]. One common contributor to presenteeism is working with

chronic musculoskeletal pain, which is also a risk factor for decreased work ability and performance [6]. Presenteeism is estimated to be more costly than absenteeism, and there is evidence [7] of increased prevalence of presenteeism among distressed workers. Therefore, understanding the relationship between physical factors (such as injury) and psychological factors (such as distress) in high-demand industries is important for developing injury prevention and management programs, building a sustainable workforce, and improving performance and productivity.

Previous studies have illustrated the importance of balancing job demands with adequate job control for better working health [8–13]. It has been demonstrated that employees working in high-

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strain jobs (i.e., jobs characterized by high demands, low job control, and low social support) will experience a greater number of health problems over time than workers in other jobs [14]. In Australia, it has been reported that blue-collar workers, machine operators, drivers, and laborers are less likely to rate their health positively compared with other occupational groups [15]. This may, in part, reflect the limited autonomy and control these workers have in relation to the planning and pacing of their work activities. It may also reflect the tendency in these male-dominated workforces to adopt a culture of stoicism, resulting in decreased help seeking and early intervention [16]. These health perceptions are particularly pertinent in production-driven industries such as mining. However, despite the political and media interest in this industry, only limited studies are published with regard to this population. Moreover, although safety and musculoskeletal injury have long been a focus of health and safety initiatives at mine sites, the potential impact of psychological health has only recently been acknowledged.

One psychological issue associated with pain and other health outcomes is psychological distress. The concept of distress is a broad label given to a variety of states and responses, most commonly those related to depression and anxiety [17,18]. As a construct, distress is positively related to both poor mental health and clinical psychological disorders, thereby making it an excellent general measure. A survey of large Australian companies found that 4.5% of full-time employees experience high levels of psychological distress in any given month [19]. This finding is significant as distress is associated with decreased work ability [20], and it appears that the majority of distressed employees are not receiving treatment (i.e., psychological counseling) [19]. Understanding the interaction between physical pain, injury, and psychological distress is therefore critical in organizational settings. A large survey of patient-care workers demonstrated significantly higher distress among workers who reported pain in the past 3 months than those who did not report pain [21]. In addition, pain intensity, number of bodily areas in which pain was experienced, psychological distress, and higher age were each independently associated with pain interference in work, suggesting that the combination of pain and distress may have particular significance for presenteeism.

In addition to the association with pain, psychological distress appears to be an important factor in occupational injury, absence, and recovery. It has also been shown to be a predictor of accident rates [22], and psychological distress may therefore have important implications for both the antecedents to injury and the potential consequences of pain such as disability. Indeed, Hall and colleagues [23] found that a future disability level of individuals is influenced by the degree to which their psychological state has been affected by their initial pain experience. In addition, Coutu and colleagues [17] found that individuals who were unable to work as a result of disability experienced higher levels of distress than individuals who were working with pain. The authors argued that loss of working identity is a crucial phase in the development of distress. By contrast, other researchers [24] have argued that distress is primarily a cause, rather than a consequence of pain. Therefore, understanding the development of distress within a population that continues to work despite pain is of vital importance, especially given the potential economic burden of presenteeism. Moreover, understanding the diversity of physical and cognitive demands associated with different occupations and job types may help determine whether intervention is necessary, and if required when and how they can be targeted to the specific needs of the worker.

The relationship between pain and psychological distress is impacted by a number of job (e.g., experience and fatigue) and person-specific (e.g., age and gender) factors. Harkness and co-workers [25] examined this relationship in a cohort of newly

employed workers followed up for 12 months and 24 months. They found a significant relationship between monotonous work and the increased risk of new-onset widespread pain. Similarly, work-related fatigue has been associated with decreased health and functioning, increased pain, depressive symptoms, and anxiety [26–28]. Miró and colleagues [27] demonstrated that poor sleep quality mediated the relationship of pain with both anxiety and depression, suggesting that pain effects sleep, which, in turn, has negative implications for mental health. In terms of age, a longitudinal analysis of the relationship between distress and musculoskeletal complaints among male oil and gas personnel showed that older individuals had a greater increase in musculoskeletal symptoms over a 5-year period [24]. In addition, nontraditional gender occupations (such as female laborers and male administrative staff) and long working hours have been associated with increased distress [19].

Lifestyle issues such as current tobacco use, sedentary behavior, and obesity have also been shown to have a linear relationship with distress, such that high distress is associated with increased risk of engaging in these unhealthy behaviors [29]. Numerous studies have demonstrated that obese individuals have an increased risk of musculoskeletal pain [24,30,31] and injury [32]. Parkes [33] examined the effects of shiftwork, job-role categories, and work perceptions on health-related outcomes based on data collected from 1,598 male personnel working on North Sea oil and gas installations. In this setting, social support was important for the prevention of mental health complaints, whereas musculoskeletal symptoms and injuries were strongly predicted by physical environment stressors (e.g., noise, vibration, poor air quality, and cramped work space). Moreover, the impact of shiftwork and job types on health was partially mediated by workers' perceptions of job control and demand. Therefore, it is suggested that how workers perceive the demands of their role and the control they have over their tasks are more important for health outcomes than objective job classification alone. Given the similarities between offshore oil and gas operations and coal mining, it is important to explore these relationships in other heavy industries and other countries as well.

Although psychological distress appears to be importantly associated with pain and injury, limited work has been done in high-risk, blue-collar industries such as mining. Such a population group is interesting as it operates 24/7 and is associated with significant psychosocial risk factors, including extended roster periods and shiftwork, high production demands, and “fly-in fly-out” arrangements causing longer periods of absence from family. In addition, how the distress–pain relationship differs by job type, age, and exposure to work requires further exploration.

The aim of this paper is to use data from a survey of Australian open-cut coal-mining personnel to examine the relationship between perceptions of musculoskeletal pain and psychological distress. It is hypothesized that (1) high psychological distress is associated with a greater number of identified pain-affected areas; (2) the aforementioned relationship will be more pronounced in monotonous workers (such as truck drivers), the overweight, less active workers, and those younger or less experienced in the industry; (3) in the presence of pain, psychological distress will be associated with greater absenteeism; and (4) fatigue indicators (i.e., sleep quality) will mediate the relationship between pain and distress.

## 2. Materials and methods

### 2.1. Participants

Two hundred and thirty-one mine workers (89% response rate) completed questionnaires during the preshift period on-site. The

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