

Risk Factors for Occupational Fatigue in Construction Workers: A Systematic Review

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KEYWORDS	ABSTRACT
KEYWORDS Occupational Fatigue; Construction Workers; Systematic Review	ABSTRACT Occupational fatigue is a common issue in various industries, particularly in the construction sector, which is characterized by high occupational risks. This study aims to identify the risk factors contributing to occupational fatigue among construction workers and propose strategies to mitigate these risks. The research employs a systematic literature review method following PRISMA guidelines. The literature search was conducted using Google Scholar, PubMed, and ScienceDirect with keywords such as "Occupational Fatigue," "Work Fatigue," "Construction Worker," "Risk Factor," and "Construction," covering publications from 2014 to 2024. Articles were selected based on inclusion and exclusion criteria to ensure relevance. The review of 12 selected articles identified several key risk factors associated with occupational fatigue, including job complexity, work stress, psychological health conditions, age, tenure, work climate, workload, and unsafe working conditions. Additionally, a negative work climate, excessive workload, and hazardous work environments were found to be major contributors to workplace fatigue. The findings indicate that addressing these risk factors is essential for improving worker safety and well-being. Implementing targeted interventions, such as workload management, stress reduction programs, and improvements in occupational health and safety standards, can significantly reduce fatigue levels among construction workers. These measures can also enhance productivity and overall job satisfaction in the
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Introduction

Data from the International Labor Organization (ILO) states that there are as many as two million workers who die due to accidents caused by work fatigue (Lestari & Wahyuningsih, 2021; Rahmawati & Afandi, 2019). This large number is because some jobs in the process still use full human labor. Work fatigue can be caused by various factors such as physical factors, psychosocial factors, work factors, individual factors and environmental factors (Adventina, 2022). There are four sub-causes of work fatigue, namely physical, biomechanical, cognitive, and psychosocial. There are other risk factors caused by fatigue which can be divided into three, namely physical

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load, mental load and environmental load (Fan & Smith, 2017). This is explained in Safe Work Australia Members Collaborative Project 13/373 where physical load includes static movements, repetitive movements (monotonous), awkward postures, and physical strength, while mental load includes working hours, the amount of time off with working hours, work shifts and work rosters, relationships with other workers, work stress, and work demands. Environmental loads are considered to cause fatigue, this is because workers are exposed to the environment where they work including temperature, darkness, lighting, vibration, climate, and other exposures (Golmohammadi & Darvishi, 2020; Mahdavi et al., 2020). Psychosocial factors are closely related to sleep habits and lifestyle in each individual, the internal health of a person's body is influenced by the amount of rest time during sleep, smoking habits, caffeine or alcohol consumption which also has an impact on emotions and self-control at work (Tran et al., 2020).

Construction work has a high occupational risk (Alfiyah et al., 2023); Manurung, 2020). Work safety in the construction world shows that organizational factors and human factors play an important role as the main cause of fatal work accidents rather than technical failure factors (Rafieyan et al., 2022). Construction workers are prone to fatigue because their work involves heavy workloads, awkward working postures and prolonged working hours (Zhang et al., 2015). Previous research conducted by Pei Pei et al., (2023) mentioned that various factors cause worker fatigue, including excessive workload, excessive elevation, work elevation and age. However, it is known that not much research has been done to determine the risk factors for fatigue in construction workers so it is necessary to conduct research on what are the factors at risk of fatigue in construction workers as a reference for workers and companies.

Despite two million workers dying each year from fatigue-related workplace accidents, there is limited research specifically focusing on fatigue risk factors among construction workers. Previous studies have identified physical, biomechanical, cognitive and psychosocial factors as contributors to occupational fatigue. In addition, Fan & Smith's (2017) research stated that physical, mental, and environmental loads have also been outlined as causes of fatigue. However, research specifically exploring these risks in construction workers, who face heavy workloads, awkward postures and long working hours, is minimal. The study by Pei Pei et al. (2023) has highlighted general factors such as workload, work elevation, and age, but has not deeply examined specific risks in the construction industry.

This research aims to summarize the various research results by identifying and analyzing the risk factors that contribute to fatigue to reduce the level of occupational fatigue among construction workers. Other objectives are also to improve safety protocols in the prevention of occupational fatigue, improve workers' physical and mental health, increase workers' productivity and as valuable information for policy makers in creating regulations and standards to ensure safer working conditions in the construction industry.

Materials and Methods

In this study using the literature review method with the "PRISMA" (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Guidance 2020. The following are the steps used to conduct this research. Literature search through electronic media through Google Schoolar, PubMed and Science Direct which are available in fulltext. Search using a combination of keywords "Occupational Fatigue", "Work Fatigue", "Construction Worker", "Risk Factor", "Construction" using 2 languages, English and Indonesian. The following are the steps used to conduct this research.



After collecting through the database, the next step was to filter the articles through the year of publication, title, research method, language, fulltext. The articles were then examined to collect the inclusion and exclusion criteria. There were inclusion criteria in this study, namely articles in English and Indonesian, articles related to specific occupational fatigue risk factors in construction workers and articles used in the form of research or case reports published between 2014 and 2024 and articles can be available in fulltext and accessible. While the exclusion criteria, namely articles with the literature review method and articles that discuss related risk factors for occupational fatigue in construction workers.

The number of articles identified from the database was 126 articles. Before filtering, 12 articles were deleted because they had duplicates, making 114 articles. Identification of articles through other methods which are not sourced from Google Scholar, PubMed and Science Direct there are 10 articles so that there are 104 articles that are assessed for eligibility. Then, the screening process was carried out using the inclusion criteria resulting in 17 articles excluded because the

year of publication of the article was not between 2014 and 2024. There are 29 articles that cannot be downloaded so that the remaining 58 articles can be assessed for eligibility.

Then, the screening process was carried out using exclusion criteria resulting in 24 articles excluded because the research did not discuss the risk factors for occupational fatigue in construction workers. As many as 22 articles were excluded because they did not discuss the literature review method. Therefore, the number of studies identified through the database analyzed in this study was 12 articles.

Results and Discussions

Based on the screening results of the journal search by combining the keywords "Occupational Fatigue", "Work Fatigue", "Construction Worker", "Risk Factor", "Construction" 12 journals that fit the research criteria were reviewed and reviewed in this study. Table 1 below shows the previous literature that has been referenced in this study. Based on existing research, some of the risk factors for occupational fatigue often experienced by construction workers include the complexity of work variables that significantly affect fatigue levels (Winanda et al., 2017), occupational stress associated with negative behaviors such as decreased performance and increased work conflict (Wu et al., 2018), and poor psychological health conditions due to unhealthy lifestyles and work attitudes (Fordjour & Chan, 2019). Occupational stress can be associated with negative behaviors such as decreased performance and increased work conflict due to the mental and emotional stress that employees experience in a demanding work environment. Prolonged stress can lead to fatigue, decreased motivation, and decreased concentration, which has a direct impact on productivity and work quality. Research by Sari et al. (2021) shows that job stress correlates with a decrease in employee performance, as individuals who experience high stress tend to have difficulty completing tasks on time and with the expected level of accuracy. In addition, stress can also affect employees' psychological well-being, which in turn decreases job satisfaction and commitment to the organization. This aspect can worsen communication between employees, leading to misinterpretations and misunderstandings that can trigger tension and conflict. According to a study by (Aruldoss et al., 2021), work stress affects team dynamics and interpersonal relationships, increasing the likelihood of conflict as employees become more irritable and less tolerant of coworkers' mistakes. This condition is exacerbated by a competitive work environment and high expectations, which can increase friction among team members. As a result, the work atmosphere becomes disharmonious, disrupting the team collaboration and synergy needed to achieve organizational goals.

In addition, other risk factors include age, tenure, work climate, and workload that have a significant association with fatigue (Boekoesoe et al., 2023), as well as unsafe and unhealthy working conditions such as noise, vibration, dust, asphalt fumes, poor work posture, and injuries (Abrar et al., 2017). Research also shows that individual factors such as age, gender, and job type have an influence on fatigue levels (Agustin & Sariah, 2018). The combination of these factors shows the importance of paying attention to risk variables in the construction work environment to reduce the level of fatigue in workers. Age, tenure, work climate, and workload have significant relationships with employee fatigue based on various recent studies. First, age and tenure directly affect the level of fatigue due to the aging process and the duration of exposure to work tasks. According to a study by Hybels et al. (2022), older workers tend to experience higher fatigue than younger workers, especially if they have been working for a long period of time. This is due to physiological decline and a decrease in the body's regeneration ability with age, which is exacerbated by accumulated work stress from previous years. In addition, workers with long tenure

Journal of Indonesian Social Sciences, Vol. 6, No. 1, January 2025

often face monotonous work routines, which can lead to decreased motivation and increased mental fatigue.

Work climate conditions and workload also play an important role in influencing employee burnout. A negative work climate, such as a stressful work environment, lack of social support, and interpersonal conflict, can increase employee stress and burnout. Research by Udho & Kabunga (2022), found that an unfavorable work climate increased the risk of burnout by 35%. Excessive workload also contributes significantly to burnout, due to physical and mental demands that exceed an individual's capacity to endure for long periods of time. The study by (Clauss et al., 2021), showed that high workload correlates with increased physical and emotional exhaustion, leading to decreased productivity and quality of life for employees. Thus, age, tenure, work climate and workload are closely interrelated and significantly influence the level of fatigue in the workplace.

Unsafe and unhealthy working conditions have a significant relationship with fatigue because poor working environments can increase stress and psychological distress in workers. According to research published by (Dodoo & Al-Samarraie, 2021), workers exposed to dangerous and inadequate working conditions, such as exposure to toxic chemicals, excessive noise, and poor ergonomics, tend to experience higher stress. This stress, in turn, disrupts sleep quality and worklife balance, which are major factors in the development of fatigue. The study also showed that workers in unsafe environments often feel anxious about the risk of injury or illness, which can exacerbate their physical and mental fatigue.

In addition, unhealthy working conditions, such as long working hours and irregular work schedules, can affect the body's circadian rhythm, which regulates a person's sleep and wake patterns. A study by (Basaria, 2023), found that workers involved in night shifts or who work more than 10 hours a day are more prone to sleep disorders and chronic fatigue. Irregular work schedules can also disrupt eating habits and physical activity, all of which contribute to an increased risk of fatigue. Overall, unsafe and unhealthy working conditions create additional burdens on workers that can lead to decreased productivity and quality of life.

Job complexity has long been identified as a key factor influencing worker fatigue levels. This complexity includes various elements such as cognitive workload, level of responsibility, and the need for multitasking. A study by Phungsoonthorn & Charoensukmongkol (2022) showed that workers engaged in tasks of high complexity tend to experience faster mental fatigue than those whose tasks are simpler. This is due to the constant need to process complicated information and make quick decisions, which increases cognitive stress and drains individuals' mental resources. In addition, high job complexity is often associated with greater levels of uncertainty and ambiguity, which can increase stress and, ultimately, fatigue. Research conducted by Sonnentag & Fritz (2015) found that uncertainty in work roles leads to an increase in stress hormones such as cortisol, which contributes to the sensation of chronic fatigue. This uncertainty forces workers to be constantly alert and ready for change, which strains their adaptive capacity and leads to a decline in mental health.

Conclusion

This research shows that occupational fatigue in construction workers is influenced by various risk factors, including job complexity, occupational stress, psychological health conditions, age, tenure, work climate, workload, and unsafe and unhealthy working conditions. High job complexity triggers mental fatigue due to cognitive pressure and the need for multitasking. Job stress contributes to decreased performance and increased conflict, and worsens psychological *Journal of Indonesian Social Sciences*, Vol. 6, No. 1, January 2025 215

well-being. Age and tenure factors influence fatigue due to the aging process and duration of exposure to work stress. Negative work climate conditions and excessive workload also increase the risk of burnout. In addition, unsafe and unhealthy working conditions exacerbate fatigue through physical and psychological stress resulting from hazardous work environments. The implications of this study emphasize the importance of managing these risk factors to reduce occupational fatigue and improve worker productivity and well-being.

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