



Factors Affecting Work Fatigue in Firefighters

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KEYWORDS

Influencing factors, Work Fatigue, Work Burnout, Sleep Deprivation, Firefighting

ABSTRACT

Burnout in firefighters is a common problem caused by high levels of vigilance and occupational risk. Work fatigue can affect their performance and safety. Factors such as heavy workloads, high stress, and poor sleep quality can lead to work fatigue. Work stress can also affect their performance. This study aims to analyze the factors that affect work fatigue in firefighters and implement control measures to reduce the risk of such work fatigue. The authors conducted a systematic review of work fatigue in firefighters and the factors that affect it. The search was carried out using the PRISMA method with keyword collaboration from several sources. There were 338,906 related studies that could be re-selected. The authors categorized the factors that affect the work fatigue of firefighters in a table based on the literature. The results show that many factors have a relationship with work fatigue. The study found factors that affect firefighters' work fatigue, such as age, gender, length of work, workload, and sleep quality. In this study, several other factors were also found, but further research is still needed. Efforts to mitigate work fatigue among firefighters are crucial given its detrimental effects on their performance and safety. Identifying and addressing factors such as workload management, stress reduction, and sleep improvement are essential steps towards enhancing overall well-being and operational effectiveness within this vital profession.

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INTRODUCTION

Work fatigue is a common problem faced by workers, including firefighters. This is due to the fact that firefighters must always do their best in their jobs and a high level of vigilance and caution against any job risks. Work fatigue can have an impact on the performance and safety of the firefighters themselves. Therefore, improving the Fire Service's management system for occupational safety and health is crucial and provides legal protection to firefighters from hazards that arise while performing their duties (Panjaitan, Tarigan, Hamonangan, & Purba, 2022). Various factors have been identified as potentially causing burnout in firefighters, including heavy workloads, high stress, and poor sleep quality. The term 'burnout' refers to a state of emotional, physical, and mental exhaustion caused by prolonged stress or overwork. A study stated that two risk factors that cause firefighters to experience heavy workloads and work fatigue are the high incidence of fires and the scarcity of fire stations in an area (Maryono & Herbawani, 2023). Heavy workloads can be physical loads, such as lifting weights, or mental burdens, such as stress and emotional distress experienced by firefighters while working in critical and dangerous situations. Heavy workloads can affect their performance, making them more susceptible to burnout.

Another important component in evaluating firefighter fatigue is work stress. The mental anguish that firefighters may feel due to the high demands of the job, the great responsibility, and the need to work quickly and precisely in dangerous and precarious situations is known as work stress. Work stress can affect firefighter performance, which increases the risk of burnout (Izza & Martiana, 2023). Firefighters who have a high level of work fatigue are indicated to have poor sleep quality. Stress at work and poor sleep quality can increase the risk of burnout in firefighters. The performance of firefighters can be negatively affected by poor sleep quality, thus increasing their vulnerability to work fatigue.

Many factors affect work fatigue in firefighters. Based on the explanation above, this study aims to provide a systematic literature review of the variables of factors that affect work fatigue in firefighters so that control actions can be taken to prevent the risk of work fatigue in firefighters.

METHOD

This study is a systematic review where the author conducted a literature search related to the occurrence of work fatigue in firefighters due to the factors that affect it. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) method is used by the author as a guide in the preparation of this review literature which is carried out systematically by following the research stages correctly. The search for research articles relevant to this research topic was carried out using keyword collaboration: associated factors, influencing factors, job fatigue, job burnout, sleep loss, risk factors, and firefighter from Science Direct, Elsevier, Scopus, and Google Scholar. As for the inclusion criteria in the systematic review, the researcher used original studies related to topics that were not systematic study studies, quantitative studies using various study designs, international studies published in 2015-2024, and open access to studies. Researchers found 338,906 related studies that could be selected using the PRISMA method.

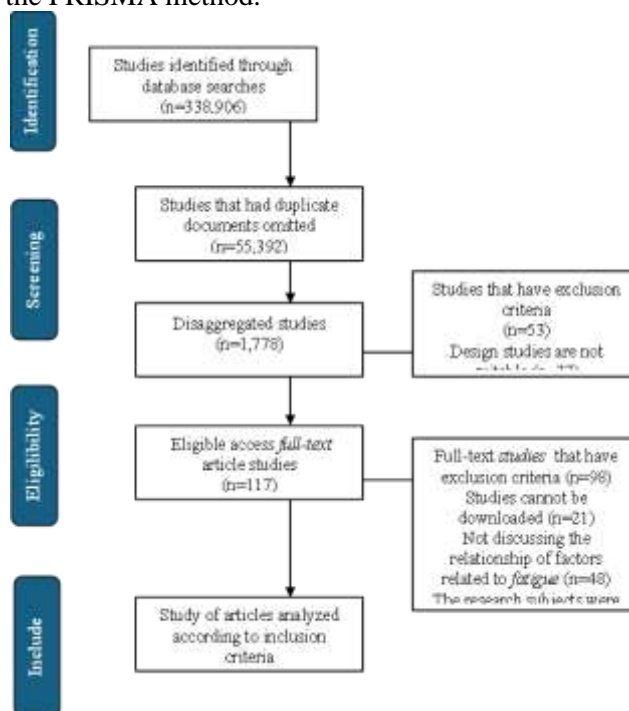


Figure 1. The process of extracting the review literature using the PRISMA method

RESULT AND DISCUSSION

From the results of the literature review, the author categorizes the distribution of influencing factors into a table, an extraction that explains the significance of factors that affect the relationship of work fatigue in firefighter workers. From the results of the extraction, it was obtained that the factors

of age, gender, education, working period, workload, working time, sleep quality, sleep quantity, work stress, work experience, work environment, emotional intelligence, trauma, self-compassion, neuroticism, conflict resolution style, organizational climate, self-efficacy, smoking, work speed, self-esteem, behavior, physical and cognitive demands, conflicts with regulations and fatigue management strategies have a relationship with work fatigue in officers firefighter.

Table 1.
Results of literature extraction

Factor	Journal
Age	1, 3, 11
Gender	3
Working period	9, 11
Workload	1, 14
Working time	1, 10, 11, 19
Sleep quality	2, 13, 15, 16, 17
Sleep quantity	13, 16, 17, 19
Work stress	2, 6, 12, 15, 18
Work experience	3
Work environment	14
Emotional intelligence	5, 6, 8,
Level of exposure to trauma/incidents	3
Self-Compassion	4, 6
Neuroticism	7
Conflict resolution style	5
Organizational climate	8
Self-efficacy	9, 12
Smoking status	11
Work rhythm/speed	14
Self-esteem	15
Behavior patterns	15
Physical and cognitive demands	19
Conflict with regulations	19
Fatigue management strategies	19

Age Factor

Work stress is one of the factors that cause work fatigue. Work stress is the tension or emotional pressure experienced by a person who faces high demands, great responsibility, and the need to work

quickly and accurately in critical and dangerous situations (Maryono & Herbawani, 2023). According to Rodrigues et al. (2023), Younger, less experienced firefighters look more tired. Meanwhile, according to Apriliani et al. (2023), older firefighters over 30 (thirty) are more likely to experience severe fatigue compared to younger firefighters. However, according to Vinnikov et al. (2019), Compared to others, regardless of age or work experience, fire managers are more tired.

Gender Factor

According to research by Rodrigues et al. (2023), Although men tend to experience more traumatic incidents, women have higher rates of PTSD, which makes them more susceptible to burnout due to compassion.

Working Time Factor

Higher perceptions of stress as well as a greater risk of fatigue caused by fatigue, are associated with increased firefighter service life (Makara-Studzińska, Wajda, & Lizińczyk, 2020). Research by Apriliani et al. (2023) found that firefighters who worked at the South Jakarta Fire and Rescue Service Office with more than 10 years of service had a 6,380 times greater risk of severe work fatigue than officers with shorter service periods.

Workload Factor

The high number of fires and the low number of fire stations are risk factors that cause firefighters to experience a lot of workload and fatigue, which reduces their performance and threatens their work safety Maryono & Karin Herbawani, (2023). Research by Dos Santos et al. (2018) mentioned that military firefighters are more prone to fatigue and burnout due to heavy workloads.

Working Time Factor

According to research by Maryono & Karin Herbawani (2023), Firefighters who have overtime have a 2,368 times greater risk of experiencing a fairly poor performance compared to officers who don't. Excessive working hours and lack of rest can cause officers to become physically and mentally exhausted, which can reduce alertness and hinder their ability to make decisions quickly, leaving them unable to do whatever they want. Research by Jeklin et al. (2020) mentioned that forest firefighters experience chronic fatigue, cognitive impairment, and sleep deprivation due to long work schedules with long shifts and inadequate recovery time. The results suggest that the work-break cycle may not allow full recovery between assignments. Firefighters with longer and irregular hours are more likely to experience higher fatigue levels than those with better work time management (Apriliani et al., 2023). Research by Dawson et al. (2015) The long and unpredictable working hours associated with firefighting can contribute significantly to burnout, which in turn can negatively impact the safety and performance of volunteer firefighters. Developing an effective fatigue management strategy is an important area for improvement in the emergency services sector.

Sleep Quality Factors

Firefighters with poor sleep quality were 45.9% more likely to experience high work fatigue levels than those with good sleep quality (Izza & Martiana, 2023). It is necessary to address sleep and mental health problems so that firefighters do not burn out. Increasing the amount of time spent sleeping during night shifts may be a very important intervention strategy (Wolkow et al., 2019). According to Lee (2018), Increased firefighter fatigue is strongly associated with poor sleep quality. Improving sleep quality, coping with work stress, and psychosocial factors can help reduce fatigue and improve overall well-being. Wildfire firefighters show poor sleep quality, especially during intense initial attack tasks McGillis et al., (2017). According to Vincent et al. (2015), The quantity of sleep is disrupted during forest firefighting which can increase the risk of fatigue-related injuries. Targeting factors such as sleeping location, shift length, and shift start time can help improve firefighters' chances of sleep and manage burnout.

Sleep Quantity Factor

Sleep disturbances, mental health, and fatigue are reduced by shorter sleeps during night work (Wolkow et al., 2019). A study conducted by McGillis et al. (2017) showed a clear association between high levels of fatigue and suboptimal sleep quantity of forest firefighters, especially during heavy duty. To manage the risk of fatigue and safety in this physically demanding job, addressing sleep issues is an

important consideration. A study conducted by Vincent et al. (2015) suggests that the increased level of firefighter fatigue can be attributed to the lack of sleep they experience during wildfirefighting. If the amount of sleep is reduced, especially for several days in a row, it can lead to ongoing sleep deprivation, as well as problems with physical and cognitive abilities. Because of this increased fatigue, the health and safety of firefighters is particularly vulnerable. During long emergency response efforts, volunteer firefighters are more often burned out, which impairs their physical and cognitive performance. It is critical to the safety of firefighters to develop formal and informal strategies to manage this fatigue (Dawson et al., 2015).

Work Stress Factors

The fact that there is a significant positive correlation between work stress and work fatigue suggests that higher levels of stress in the workplace are associated with higher levels of burnout (Izza & Martiana, 2023). A study conducted by (Lee, 2018) shows that long-term work stress, either directly or indirectly due to sleep disturbances and psychosocial factors, is the main cause of burnout and burnout among firefighters. Addressing work stress and improving sleep hygiene may be an important strategy for reducing high-risk firefighter fatigue. Research by Pace et al. (2022) suggests that fatigue and other mental stress can be caused by the work stress experienced by firefighters. Meditation seems to be a great tool for reducing the effects of stress associated with high-risk work. A study by Makara-Studzińska et al. (2019) emphasized how important it is to be an expert in self-efficacy as a personal tool that can reduce the stress impact felt by most of the symptoms of fatigue experienced by firefighters who are in high-risk positions. This study shows that the development of self-efficacy should be an important component of psychoeducational and fatigue prevention programs for firefighters. Research results by Lee (2018) It show that work stress is the biggest factor affecting firefighters' fatigue levels, followed by socio-psychological factors and sleep quality. A study by Vaulerin et al. (2016) shows that understanding firefighters' work stress and fatigue is essential. Overcoming neuroticism and encouraging goals through mastery can help prevent burnout in this stressful job.

Work Experience Factor

Research by Rodrigues et al. (2023) showed that less work experience and greater exposure to traumatic events correlated with higher levels of compassion fatigue in firefighters. With longer working hours, firefighters seem to be developing better coping strategies to overcome burnout.

Work Environment Factors

A study by Dos Santos et al. (2018) found that although there were no cases of severe burnout, many firefighters were at high risk of developing burnout syndrome due to the difficult work environment. Factors such as excessive overtime, fast pace of work, and poor workplace organization are some of the environmental stressors that may cause burnout and burnout in the workplace.

Emotional Intelligence Factor

Research by Pace et al. (2022) shows that emotional intelligence is a valuable asset for healthcare professionals because it can help reduce fatigue and burnout. Companies can help their employees to stay healthy and strong when dealing with job stress. Research by Michinov (2022) shows that conflict management style and emotional intelligence are personal resources that contribute to a decrease in firefighter fatigue. Helping firefighters manage their emotions during conflicts and stressful situations can also help maintain their mental health and well-being. According to Jeung et al. (2021), Emotional intelligence, demonstrated by the ability to handle emotional demands in the workplace, is considered an important component that contributes to the level of fatigue and boredom that firefighters experience while on the job. Studies have shown that this is an important factor contributing to firefighters' fatigue and boredom levels. Nonetheless, the work environment and work environment can go a long way in controlling the negative impact of emotional work on burnout.

Trauma/Incident Exposure Level Factors

The more often firefighters are exposed to traumatic events, even if they don't experience them directly, the higher their risk of developing compassionate burnout and secondary trauma symptoms (Rodrigues et al., 2023).

Self-Compassion Factor

Findings by Pace et al. (2022) show how important it is to protect health workers from fatigue and burnout. By learning self-compassion skills and self-care practices, people can improve emotional resilience, reduce work-related stress, and maintain their well-being in a difficult work environment. Research by Lv et al. (2024) It found that self-compassion to self partly mediates the relationship between the stress that firefighters feel and the fatigue they experience at work. Firefighters who experience higher levels of stress tend to have higher levels of self-compassion than the inferior self, which in turn causes them to be more tired at work. In addition, the study showed that negative coping styles serve as an additional link between the level of stress a person experiences and work fatigue.

Neuroticism Factors

Research by Tao et al. (2022) found that neuroticism, a personality trait characterized by emotional instability, is a significant risk factor for firefighters in China against work burnout as well as mental health problems such as depression and anxiety. Surprisingly, the poor effects of neuroticism on fatigue are exacerbated by organizational support, suggesting that cultural and organizational elements may play a complex role in these relationships.

Factors of Conflict Resolution Style

It is essential for firefighters to learn conflict management skills and emotional intelligence to reduce burnout and burnout in the workplace. Training programs that focus on conflict management and emotional regulation may be beneficial for improving employee mental health and well-being in stressful workplaces (Tao et al., 2022).

Organizational Climate Factors

Research by Jeung et al. (2021) Demonstrates that a cooperative and supportive work environment can help reduce the negative effects of high emotional demands on firefighters' health and burnout.

Self-Efficacy Factor

Research by Makara-Studzińska et al. (2019) showed that self-efficacy is an important personal resource for reducing the impact of stress felt on most of the symptoms of burnout experienced by firefighters. Therefore, strengthening self-efficacy should be a key focus in fatigue prevention programs and interventions designed for individuals working in high-risk occupations, such as firefighters. Research results by Makara-Studzińska et al. (2020) suggest that increasing firefighters' overall confidence can be an important strategy for reducing the stress levels they experience and the various aspects of work fatigue they experience. Increasing self-confidence appears to be an important component in reducing the negative effects of job demands and stress faced by this group of high-risk workers.

Smoking Factors

Research by Apriliani et al. (2023) found that smoking is a major risk factor for firefighter burnout. This may be due to the negative physiological effects of smoking on oxygen consumption and cardiovascular health. One way to reduce fatigue in this high-risk workplace is to address smoking behavior.

Work Speed Factor

A higher work speed can increase stress, stress, and feelings of being overwhelmed, which in turn can lead to emotional and physical exhaustion. With a more manageable and moderate work tempo, firefighters can better cope with stressful work demands. In summary, research shows that work speed or work environment is an important factor associated with the risk of fatigue and burnout in this population of military firefighters. Faster work rates are associated with higher levels of emotional fatigue and burnout (Dos Santos et al., 2018).

Self-Esteem Factor

Research by Lee (2018) suggests that self-esteem is negatively correlated with fatigue; Firefighters with higher self-esteem tend to show lower symptoms of fatigue. This shows how important it is to consider psychological components such as self-esteem when dealing with work-related fatigue among those working in these positions.

Behavioral Pattern Factors

Research by Lee (2018) showed that firefighters with stronger Type A behavior patterns, which are indicated by characteristics such as competitiveness and urgency of time, were more prone to burnout. This suggests that when dealing with fatigue caused by this stressful work, it is important to consider the behavioral aspects as well as the stress associated with psychological and occupational resources.

Physical and Cognitive Demand Factors

Research by Dawson et al. (2015) mentioned that volunteer firefighters are very tired due to physically and mentally heavy work, long working hours, and little sleep. Furthermore, this fatigue jeopardizes their physical and cognitive abilities while at the scene of a fire, posing a significant safety risk. Effectively controlling this fatigue is essential for firefighters' health and operational effectiveness.

Factors of Conflict with Regulations

The development of informal handling strategies suggests that there is a need to better integrate these practices into formal burnout risk management frameworks, as regulatory conflicts between formal burnout policies and the operational realities of firefighting lead to higher stress and burnout (Dawson et al., 2015).

Fatigue Management Strategy Factors

Factors that can exacerbate volunteer firefighter burnout include the lack of a formal burnout management system, the need to rely on informal handling strategies, disagreements between regulations and service delivery, and organizational culture related to burnout. To support the long-term health and well-being of this critical workforce, it is critical to address this systemic problem (Dawson et al., 2015).

CONCLUSION

The conclusion is that work fatigue is a common problem faced by workers, including firefighters. Factors that contribute to work fatigue include heavy workloads, high stress, and poor sleep quality. Work fatigue can affect the performance and safety of firefighters themselves. Therefore, it is important to improve the occupational safety and health management system in the Fire Service and provide legal protection to firefighters from the dangers that arise while carrying out their duties.

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