Review: Journal of Multidisciplinary in Social Sciences

Volume 01 No 10 September 2024
E ISSN : 3031-6375
https://lenteranusa.id/

Analysis of Ergonomics in Improving Occupational Efficiency and Health in Shift Work : Literature Review

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Abstract
This study aims to analyze the application of ergonomic principles in improving occupational efficiency and health in shift work. Through a review of the literature, it was found that ergonomic interventions, such as setting working hours, adding breaks, and designing workplaces accordingly, can significantly reduce fatigue and stress levels in employees. Various studies show that workload adapted to the physical capacity of workers can reduce musculoskeletal complaints and increase productivity. The results of the analysis show that the application of ergonomic principles is not only beneficial for workers' health, but also improves the company's operational efficiency. Therefore, it is recommended that companies consider implementing ergonomic policies in human resource management to create a healthy and productive work environment. This research provides important insights for managers and stakeholders in designing work systems that support employee well-being in a shift work environment.

Keywords: Ergonomics, Occupational Health, Efficiency, Shift Work, Fatigue

Introduction

Shift work systems have become a common practice in various industries to improve productivity and operational efficiency. However, the implementation of these systems often negatively impacts the physical and mental health of workers. Workers who work shifts, especially night shifts, are more likely to experience problems such as fatigue, sleep disturbances, and an increased risk of injury. Research shows that a lack of attention to ergonomic factors in job design can exacerbate this condition, so it is important to conduct an ergonomic analysis in the context of shift work.

Ergonomics is a science that studies the interaction between humans and other elements of the work system, with the aim of improving the efficiency and well-being of workers. Research by (Sawarni, 2017) shows that an unergonomic shift system design can lead to increased stress and fatigue in employees. In his research, Sarwani found that the implementation of better shift management can significantly reduce work stress levels. In addition, research by (June, 2020) also emphasizes the importance of ergonomic design in reducing work fatigue in shift workers by showing a significant relationship between shift work systems and the level of fatigue experienced by workers in manufacturing. The purpose of this study is to analyze how the application of ergonomic principles can improve occupational

efficiency and health in shift work. By understanding the ergonomic factors that influence, it is hoped that solutions can be found to create a healthier work environment for workers and increase company productivity.

In previous literature reviews, several studies have discussed the impact of shift work systems on worker health. For example, research by (Fitriyani, 2021) shows that workers who work night shifts have a higher risk of experiencing fatigue and health problems compared to those who work morning or evening shifts. This study highlights the need to pay attention to work and rest time management to maintain workers' health. The novelty of this study lies in its comprehensive ergonomic analysis approach to shift work systems, with a focus on developing practical recommendations to improve job design and reduce health risks for workers. Thus, this research can make a significant contribution to the development of corporate policies related to human resource management and better workplace design.

The main reason for conducting this study is the increasing prevalence of health problems associated with shift work. A study by the Ministry of Health of the Republic of Indonesia (2021) shows that shift workers have a higher risk of experiencing sleep disturbances, stress, and other health problems compared to regular workers. In addition, the lack of in-depth research on the application of ergonomics in shift work in Indonesia is an important background for conducting this study. By understanding and applying ergonomic principles, it is hoped that it can reduce these negative impacts and improve the welfare of workers.

The purpose of writing this article is to dig deeper into how to apply ergonomic principles in shift work and how it can have a direct impact on health and work productivity. By paying attention to ergonomic factors that affect work health and productivity, this research is important to provide a more comprehensive understanding of the importance of ergonomics in the shift work environment. Through the results of this study, it is hoped that suggestions will be found that can make a positive contribution to improving the implementation of ergonomics in the shift work environment. Thus, companies or organizations that have a shift system can improve the working conditions of their employees so that their health and work productivity can be well maintained. By providing advice based on research findings, it is hoped that there will be positive changes in the shift work environment that will ultimately improve the well-being and overall performance of employees.

Method

In this study, the method used is the literature review method. This study aims to analyze the relationship between the application of ergonomic principles and occupational efficiency and health in shift workers through a review of existing literature. The data used consisted of 15 literature sources from the previous 10 years, including journals, articles, and previous research that discussed ergonomics in the context of shift work. Data collection was carried out by browsing academic databases such as Google Scholar, Science Direct, and the Garuda Portal to identify articles that met the inclusion criteria. Data analysis is carried out by synthesizing information from various sources to find patterns and relationships between ergonomic, work efficiency, and worker health variables. With this approach, the research is expected to provide deeper insights into the application of ergonomic principles in improving

the performance and health of shift workers. The framework describing this study can be seen in figure 1

Figure 1. Research Framework

Results and Discussion

The findings of this literature review discuss producing a database that can become a standard digital storage medium that meets the needs of the company. Descriptive analysis of literature review related to ergonomic factors in shift work systems. The database finds several articles that are classified based on the year of publication and the origin of the journal.

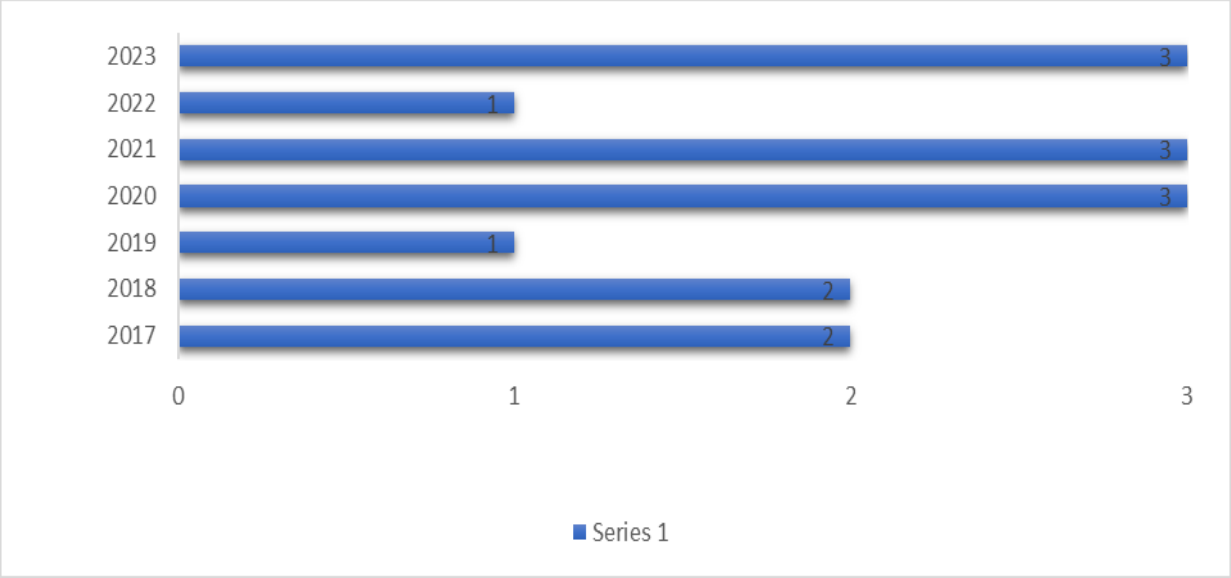

Figure 2. Article Classification Based on Year of Publication

The list of selected articles is then analyzed from the aspect of what ergonomic factors affect occupational efficiency and health, as shown in table 1 below

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Table 1. Results of Analysis of Ergonomic Factors Affecting Occupational Efficiency and Health

Paper Identity	Classification of Ergonomic Factors That Affect Occupational Efficiency and Health		
	Shift System	Work Environment	Workload
Sarwani (2017)	✓		
Yuliana & Krisda (2023)		✓	
Risma.A.S. et al. (2021)			✓
Tabita et al. (2017)	✓		
Nature (2020)	✓		
Rikit, M.R et al. (2020)	✓		
Ningsih et al. (2021)		✓	✓
Yulipa (2018)	✓		✓
Mulfiyanti, D et al. (2019)	✓		
Rizki & Rahmawati (2022)		✓	
Tribuana Yogaswara and Zulkifli Djunaidi (2023)		✓	
June (2020)	✓		
Fitriyani (2021)	✓		
Yuliana P (2018)			✓
Lina Y (2023)	✓		

Source: Data Processed by Researchers (2024)

Discussion

In this study, the results of the literature analysis on ergonomics in improving occupational efficiency and health in shift work show that the application of ergonomic principles can significantly reduce the level of fatigue and work stress in employees. Based on a review of several previous studies conducted by (Sarwani, 2017), it was found that improvements in the design of work shifts, including the addition of rest time and better management of working hours, can lower stress levels from an average score of 47.07 to 27.27 after the implementation of the new system. The study also recorded a decrease in fatigue rates from 23.50 to 16.20, suggesting that ergonomic interventions have a positive impact on the mental and physical health of workers.

In addition, a study by (Yuliana & Krisda, 2023), stated that there was a significant relationship between work conditions and fatigue levels in shift workers at PT XYZ Balikpapan. Research ii highlights the importance of setting an ergonomic work environment to support worker health. This result is in line with research by Risma.A.S. et al. (2021), which showed

that shifting workloads in accordance with the physical capacity of workers can reduce musculoskeletal complaints and increase productivity.

Furthermore, research by (Tabita et al, 2017) shows that improving ergonomic-based work organization in housekeeping workers can reduce musculoskeletal complaints and fatigue rates by 36.31% and 36.44%, respectively. This study emphasizes the importance of better working time management to improve worker efficiency and health. Another result of a study by Kodrat (2020) revealed that workers who underwent night shifts tended to experience increased blood pressure and slower reactive time compared to morning shift workers. This shows the negative impact of night shifts on the physical health of workers. This study is in line with the findings (Risma.A.S. et al, 2021), which show that setting the workload in accordance with the physical capacity of workers can reduce musculoskeletal complaints and increase productivity.

Furthermore, research by (Ratih et al, 2020) found that work stress in nurses in hospitals can be reduced with the implementation of a better shift management system, including additional rest time and flexible scheduling. These findings support the argument that ergonomic interventions can contribute to workers' mental well-being. Then research by (Ningsih et al, 2021) confirmed that unbalanced workloads in shift systems can cause long-term health problems for workers, including sleep disturbances and chronic fatigue. This study shows the importance of periodic evaluation of the work system to ensure the right workload balance.

Then in a study conducted by (Yulipa, 2018) regarding the influence of workload and fatigue on occupational health and safety, it was found that these two variables had a significant impact on employee health. This study uses a quantitative approach involving 62 respondents from employees at Basarnas Gorontalo. The results of the analysis showed that workload contributed 23.8% to occupational health and safety, while work fatigue contributed 22.8%. This suggests that increased workloads can potentially increase occupational health and safety risks, especially in the context of shift work that often involves irregular working hours.

Then then in a study conducted by (Mulfiyanti.D et al, 2019) stated that nurses who work on night shifts are more prone to experiencing fatigue compared to those who work morning or evening shifts. This shows the need for more attention to shift management to maintain the health of workers.

Furthermore, research by (Rizki & Rahmawati (2022) shows that the application of ergonomic principles in workplace design can improve employee health and productivity. This study reveals that ergonomic interventions, such as adjusting work tools and adjusting body position when working, can reduce physical complaints that are often experienced by shift workers. Thus, the application of ergonomic principles is not only beneficial for physical health but can also increase employee productivity.

Then another study by (Tribuana & Zulkifli, 2023) confirms the importance of ergonomic workplace design. This study shows that good working positions and the use of appropriate tools can reduce worker fatigue and increase productivity. The results of univariate and bivariate analysis showed that there was a significant influence between ergonomic conditions in the workplace and worker fatigue levels. This is in line with previous findings

that unergonomic work can cause physical discomfort, increase the risk of injury, and decrease work efficiency.

From these results, it can be concluded that the application of ergonomic principles in the design of shift work systems is not only beneficial for workers' health but can also improve the company's operational efficiency. Good design allows workers to get enough rest and reduces the risk of fatigue and stress, which in turn improves their performance. Therefore, the implementation of ergonomic policies in their human resource management to create a healthier and more productive work environment.

Implementation of Ergonomics in Improving Occupational Efficiency and Health in the Shift System

The implementation of ergonomics in shift work can be done through several strategic steps. First, companies need to conduct an assessment of the workplace design to ensure that the work environment supports the comfort and health of employees. For example, the use of ergonomic chairs and height-adjustable tables can help reduce the risk of injury due to improper sitting positions.

Second, setting a flexible work schedule is also an important aspect in the application of ergonomics. Research by (Widyastuti & Rahmawati, 2021) shows that setting a work schedule that takes into account employees' circadian rhythms can improve sleep quality and reduce fatigue. Therefore, companies need to consider providing adequate rest time and avoiding excessive work assignments.

Third, ergonomics training for employees is also very important. Through this training, employees can understand how to work safely and efficiently, as well as recognize the early signs of health problems that may arise due to shift work. By providing the right knowledge and skills, employees can be more proactive in maintaining their health.

Conclusion

Based on the results and discussion above, it can be concluded that the application of ergonomic principles in the shift work system is proven to be significant in improving employee health and work efficiency. Various studies have shown that work design settings, such as the addition of rest time and better work hour arrangements, can reduce stress and fatigue levels. In addition, a workload that matches the physical capacity of workers can reduce musculoskeletal complaints and increase productivity. Therefore, companies are advised to implement ergonomic policies in human resource management to create a healthier and more productive work environment, so that they can maximize employee performance while maintaining their well-being.

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