

The Effect of Workload on Work Fatigue Among Production Workers at PT Prima Maesa Putra Ponorogo

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Abstract

Work fatigue is a serious problem that can affect worker productivity and safety. The ice cube production industry has the unique characteristics of a working environment with exposure to cold temperatures and high physical workload. This research aims to analyze the influence of workload on work fatigue in production workers of PT. Prima Maesa Putra Ponorogo. Quantitative research with a cross-sectional design involved 35 production workers using total sampling. Data collection used the IFRC questionnaire to measure work fatigue, and Pulse Oximeter to measure workload based on pulse. Data analysis used Kendall's tau-b test with a significance level of $\alpha=0.05$. The majority of respondents experienced moderate work fatigue (80%), and moderate workload (57.1%). The results of bivariate analysis showed a significant influence between workload with work fatigue ($p=0.001$; $R=0.483$). There is a significant influence of and workload on work fatigue in production workers. Interventions in workload management are needed to reduce worker fatigue levels.

Keywords: workload, work fatigue, production workers, ergonomics

INTRODUCTION

Work fatigue is a common problem experienced in various industrial sectors and can seriously impact productivity and worker safety. According to the International Labour Organization (ILO) in 2019, around one-third of the global workforce experiences work-related fatigue, with estimates of severe fatigue rates ranging from 18.3% to 27% (ILO, 2019). In Indonesia, more than 65% of workers report experiencing workplace fatigue, accompanied by a high rate of workplace accidents due to this condition (Ministry of Manpower of the Republic of Indonesia, 2018).

Work fatigue is defined as a subjective condition characterized by a decrease in energy, work capacity, and physical endurance that can hinder individuals from completing tasks optimally (Hutabarat, 2017). This condition can be degenerative as it reduces body performance and efficiency, while also increasing the risk of work accidents.

The factors affecting work fatigue are complex and multidimensional, including individual, occupational, and work environment factors.

Workload is also an important factor contributing to fatigue. Research by Juliana et al. (2018) shows that workers with heavy workloads exhibit a high level of fatigue of 85.7%, while those with light workloads report only 14.3%. This demonstrates a strong relationship between workload and the level of fatigue experienced by workers.

PT. Prima Maesa Putra Ponorogo is a company engaged in the production of ice blocks with unique working environment characteristics. Workers are continuously exposed to cold temperatures and perform physically demanding activities such as lifting and moving blocks of ice. A preliminary study conducted on 10 workers using the IFRC questionnaire found that 60% of workers experienced work fatigue at a fairly high level (Ministry of Manpower of the Republic of Indonesia, 2018).

Several factors influence work fatigue, including individual, occupational, and environmental elements. Juliana et al. (2018) demonstrated a strong relationship between

workload and fatigue, reporting that 85.7% of workers with heavy workloads experienced high fatigue compared to only 14.3% under light workloads.

Previous studies provide valuable insights but also leave gaps. Juliana et al. (2018) focused solely on workload without controlling for environmental conditions, while Putri and Anggraini (2019) emphasized cold exposure but did not analyze physiological measures or integrate workload quantitatively. This study aims to address these gaps by simultaneously examining the influence of workload on fatigue among production workers at PT. Prima Maesa Putra Ponorogo, using a combination of subjective (IFRC questionnaire) and objective (Pulse Oximeter) measurements.

This study aims to analyze the influence of workload on work fatigue in production workers of PT. Prima Maesa Putra Ponorogo. The results are expected to contribute to the development of strategies to prevent work fatigue in similar industries, informing approaches to improve worker safety, optimize productivity, and design targeted interventions in cold and physically demanding work environments.

METHOD

This study used a quantitative design with a cross-sectional approach to analyze the relationship between independent variables (workload) and the dependent variable (work fatigue) at a given time. The research population comprised all production workers of PT. Prima Maesa Putra Ponorogo, totaling 35 people. The sampling technique used total sampling, where all members of the population were included as research samples.

The inclusion criteria for the study were: 1) permanent workers in the production department, 2) willing to participate in the research, 3) able to communicate well, and 4) in good health at the time of data collection. The exclusion criteria were workers who were on leave or absent at the time of data collection.

The research instruments used were:

- 1) Work Fatigue: Measured using an Industrial Fatigue Research Committee (IFRC) questionnaire consisting of 30 questions on a Likert scale of 1-4. This questionnaire measures three aspects of fatigue: weakened activity, weakened motivation, and physical fatigue. Categorization of fatigue levels: low (30-52), moderate (53-75), high (76-98), and very high (99-120).
- 2) Workload: Measured using a Pulse Oximeter to measure the working pulse. Measurements are taken during breaks and while working. Categorization based on Tarwaka (2004): light (75-100 beats/minute), medium (100-125 beats/minute), heavy (125-150 beats/minute).

Data collection was carried out after obtaining approval from the company and informed consent from respondents. Data were collected through: 1) interviews using structured questionnaires, 2) pulse measurements using Pulse Oximeters.

Data analysis used SPSS software with the following stages: 1) univariate analysis to describe the characteristics of each variable, and 2) bivariate analysis using Kendall's tau-b test to assess the influence between independent and dependent variables at the significance level $\alpha = 0.05$.

The research met the principles of research ethics, including respect for human dignity, respect for privacy and confidentiality, justice and openness, and consideration of the benefits and risks involved.

RESULTS AND DISCUSSION

Respondent Characteristics

The research involved 35 production workers of PT. Prima Maesa Putra Ponorogo with an average age of 35.2 years (range of 22-55 years) and an average working period of 4.8 years (range of 1-15 years).

Univariate Analysis

Work Fatigue

The results of the analysis showed that the majority of respondents (80%, n=28) experienced work fatigue in the medium category, 14.3% (n=5) in the low category, and 5.7% (n=2) in the high category. None of the respondents experienced very high work fatigue.

Table 1. Distribution of Frequency of Work Fatigue

Fatigue Level	Frequency	Percentage (%)
Low	5	14,3
Medium	28	80,0
High	2	5,7
Total	35	100,0

Workload

The results of the workload measurement showed that 57.1% of respondents (n=20) had a moderate workload and 42.9% (n=15) had a light workload. None of the respondents experienced heavy workload.

Table 2. Workload Frequency Distribution

Workload Levels	Frequency	Percentage (%)
Light	15	42,9
Medium	20	57,1
Total	35	100,0

Bivariate Analysis

The Effect of Workload on Work Fatigue

The results of the analysis showed a clear pattern where workers with light workloads still had a considerable proportion of low fatigue (33.3%), while in moderate workload, most respondents experienced moderate fatigue (90.0%) with 10.0% experiencing high fatigue.

Table 3. The Effect of Workload on Work Fatigue

Workload	Work Fatigue			Total	Sig.	R
	Low	Keep	Tall			
	n (%)	n (%)	n (%)	n (%)		
Light	5 (33,3)	10 (66,7)	0 (0,0)	15 (100,0)	0,001	0,483
Medium	0 (0,0)	18 (90,0)	2 (10,0)	20 (100,0)		

The results of Kendall's tau-b statistical test showed a significant influence between workload with work fatigue ($p=0.001$; $R=0.483$).

Discussion

Work Fatigue Levels

The results of the study showed that the majority of workers (80%) experienced moderate category work fatigue. These findings are in line with the research of Rahmawati et al. (2024) who found moderate levels of fatigue in food industry workers. This condition is

understandable given the characteristics of jobs in the ice cube industry that demand high physical activity in low-temperature environments.

The moderate work fatigue experienced by the majority of workers shows a significant physiological load but is still within the limits of body tolerance (Sulistiarini & Widyagama, 2020). However, this condition needs attention because sustained moderate fatigue can progress to chronic fatigue if not managed properly (Mahawati, Fitriyatinur, Yanti, dkk., 2021).

The Effect of Workload on Work Fatigue

The analysis showed a very significant influence between workload and work fatigue ($p=0.001$) and a moderate positive correlation ($R=0.483$). These results are consistent with ergonomic theories which state that increased workload increases the body's physiological demands and potentially leads to fatigue.

The finding that all respondents with high fatigue were from the medium workload group showed a threshold effect, where an increase in workload from mild to moderate had a more significant impact on fatigue than further improvement. This indicates the importance of identifying and managing workloads at a moderate level to prevent excessive burnout.

Heart rate patterns measured as an indicator of workload indicate a cardiovascular response that corresponds to the intensity of physical activity. Increased heart rate reflects increased oxygen and metabolic requirements which ultimately contribute to the sensation of fatigue (Mahawati, Yuniwati, Ferinia, dkk., 2021).

Practical Implications

The results of this study have important implications for occupational health and safety management at PT. Prima Maesa Putra Ponorogo. Actionable intervention strategies include:

1. **Workload Management:** Implementation of a work system that takes into account individual capacity, provision of mechanical aids to reduce physical loads, and optimal timing of breaks (Sulistiarini & Widyagama, 2020) .
2. **Worker Health Program:** Training on the recognition of fatigue symptoms, fitness programs to increase work capacity, and periodic health check-ups.

Research Limitations

This study has several limitations that need to be considered in the interpretation of the results (Maftuh, Haryanti, & Johar, 2021). The cross-sectional design does not allow for the establishment of a definitive causal relationship (Sulistiarini & Widyagama, 2020). Fatigue measurement uses subjective instruments that can be influenced by psychological and social factors. In addition, the research was only conducted in one company so the generalization of the results needed to be done carefully (Mahawati, Fitriyatinur, Yanti, dkk., 2021).

CONCLUSION

This study concludes that workload significantly influence work fatigue among production workers at PT. Prima Maesa Putra Ponorogo, with most workers experiencing moderate fatigue that requires attention to prevent chronic conditions. It is suggested to implement comprehensive management programs for and workload, provide health support facilities for workers, and conduct advanced longitudinal research to better explore causal relationships. These interventions are expected to enhance both worker health and productivity in similar industries.

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