Work Fatigue Among Port Operational Workers: Analysis of Contributing Determinant Factor

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KEYWORDS

Work Fatigue, Operational, Port

ABSTRACT:

Introduction: Humans work to meet the needs of daily life, often they ignore the fatigue experienced by the body due to work. The purpose of this study is to see the influence of age, length of service, physical workload, nutritional status, work shift, job stress, noise and lighting on work fatigue in operational workers at the Port.

Objectives: The aim of this study is to see the influence of age, length of service, physical workload, nutritional status, work shift, job stress, noise and lighting on work fatigue in operational workers at the port.

Methods: The type of research used in this study is observational analysis using a cross sectional study design. This research was carried out for 60 days, with a total sample of 150 samples

Results: Results: Based on the results of the partial regression coefficient test, it was found that the significant values in the work shift variable were 0.006, the age variable was 0.008, the length of service variable was 0.023, the workload variable was 0.030, the lighting variable was 0.374 and the job stress variable was 0.931. Meanwhile, the BMI and noise variables could not be tested because they did not have a significant relationship in the bivariate analysis.

Conclusions: The variables of work shift, age, length of service and workload partially affected work fatigue significantly. While other variables partially have a small influence on work fatigue.

1. Introduction

Humans work to meet the needs of daily life, often they ignore the fatigue experienced by the body due to work. However, the body has limitations in activities. Work fatigue is actually the body's natural system to prevent damage and allow recovery at rest. About 20% of workers experience symptoms of work fatigue, which is a common complaint in the community [1].

The World Health Organization (WHO) predicts that the number 2 killer disease after heart disease is a feeling of heavy tiredness. According to the International Labour Organization (ILO), every year as many as two million workers die due to work accidents caused by fatigue factors. In the study, it was explained that from 58,115 samples, 18,828 of them (32.8%) experienced fatigue. Meanwhile, if workers experience work accidents caused by fatigue factors, it will have a direct impact on their work productivity levels. Meanwhile, in Indonesia, more than 65% of workers come to polyclinics with complaints of work fatigue [2].

Fatigue due to work can arise due to various facts, including mental workload, workstation, static work, monotonous work, work environment, psychological, calorie needs, rest time, age, and working hours. According to Suma'mur (2009), the root of the problem of unergonomic work fatigue, forced attitudes, static work, monotony, extreme work environment, psychology, lack of calorie needs, improper work and rest times, and so on [3].

The work environment is one of the factors that has a significant effect on work fatigue. Conditions of the work environment that do not meet standards, such as high noise levels, inadequate lighting, inappropriate humidity, and radiation exposure can result in worker fatigue. If not handled properly, this work fatigue can have a negative impact, such as an increased risk of work accidents and a decrease in worker productivity [4].

One of the jobs that has the potential to experience fatigue is operational workers. Operational workers may face various challenges that have the potential to cause work fatigue, such as tight work schedules, high work pressure, and work environment conditions that may be less than optimal. This condition not only has a negative impact on the welfare of workers, but can also affect productivity and occupational safety [5].

In port terminals, operational divisions play a major role in the loading and unloading process. The primary activity at these terminals involves loading and unloading goods to and from vessels. To facilitate these operations effectively, operators play an essential supporting role within the operational division, which carries the most significant responsibility in the terminal's activities.

In general, workers work in standing, sitting, half-bending positions, exposed to sunlight, and are monotonous for a long period of time so that the risk of fatigue is quite high where there are 32 people who experience fatigue based on the results of initial observation using an IFRC questionnaire conducted by clinical health workers at the study site.

Therefore, in-depth research on the factors that contribute to work fatigue among workers in the operational part of the port is essential. With a better understanding of these factors, companies can implement more effective strategies and policies to reduce work fatigue and improve worker well-being and performance. The purpose of this study is to see the influence of age, length of service, physical workload, nutritional status, work shift, job stress, noise and lighting on work fatigue in operational workers at the port.

2. Objectives

The aim of this study is to see the influence of age, length of service, physical workload, nutritional status, work shift, job stress, noise and lighting on work fatigue in operational workers at the port.

3. Methods

Research Design

This study is a quantitative research with an analytical observational approach using a cross-sectional design. This research was conducted for 60 days.

Participants

The population in this study is all port operational workers totaling 189 people. The sample in this study is part of the population that meets the inclusion and exclusion criteria. The samples to be taken have inclusion criteria and exclusion criteria, as follows:

- Inclusion Criteria: Operational division operator workers who are actively working
- Exclusion Criteria: Operational division operator workers who are unwilling or unable to be respondents in the study.

Thus, the total sample that meets the inclusion and exclusion criteria is as many as 150 samples.

Data collection

The data collected in this study are secondary data and primary data. Secondary data was obtained from literature studies or agencies related to this study. Primary data is data obtained directly by researchers and from respondents (samples), including:

- Lighting Intensity
  Measurement of local lighting intensity in the work environment. The instrument used in this research is a lux meter for measuring lighting intensity
- Noise
  Noise measurement in the work environment. The instrument used in this study is using a sound level meter noise measuring device
- Physical Workload
  Physical workload shows how much physical activity a worker is doing. The measurement is calculated by pulse rate units per minute (pulse/minute) using an Oxymeter

- Work Fatigue Questionnaire: The questionnaire used is the Industrial Fatique Research Committee (IFRC) consisting of 29 questions.
- Job Stress Questionnaire: The questionnaire used, namely the Depression Anxiety Stress Scale (DASS), consists of 14 statements.

Data analysis

Data management is carried out using excel software. Univariate, bivariate, and multivariate statistical analysis using IBM SPSS software suite version 22.

4. Results

Respondent Characteristic

Based on table 1, the characteristics of the 150 respondents who were sampled in this study. All workers are male as many as 150 respondents or 100%. And the majority of workers ≥ 5 years of working for 88 respondents or 58.7%.

Table 1. Table 1: Distribution of Respondent Characteristics Based on Gender, and Length of Service

Respondent Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	150	100.0
Length of Service		
< 5 Years	62	41.3
≥ 5 Years	88	58.7

Source: Primary Data, 2024

Univariate Analysis

Univariate analysis was performed for each variable in the study using a frequency distribution table, which then resulted in the distribution and percentage of each of the research variables.

Table 2: Frequency Distribution of Research Variables

Variable	**Frequency** (n)	**Percentage** (%)
Age of Workers		
Adolescent (<40 Years)	67	44.7
Elderly (≥ 40 Years)	83	50.5
Length of Service		
Low risk (<5 Years)	62	41.3
High risk (≥ 5 Years)	88	58.7
Body Mass Index		
Normal	116	77.3
Overweight	34	22.7
Work Shifts		
Safe (Day)	74	49.3
Risky (Night)	76	50.7
Physical Workload		
Light Workload	65	43.3
Heavy Workload	85	56.7
Job Stress		
Mild Job Stress	86	57.3
Severe Job Stress	64	42.7
Lighting Intensity		
Safe	84	56.0
Risky	66	44.0
Noise		
Safe	114	76.0
Risky	36	24.0
Work Fatigue		
Mild Fatigue	79	52.7

Severe Fatigue	71	47.3

Source: Primary Data, 2024

Based on table 2 above, the frequency distribution based on the age of workers, the majority of workers are ≥ 40 years old (elderly), which is as many as 83 respondents or 50.3%. Meanwhile, regarding the length of service variable, workers were dominated by the at-risk category (≥ 5 years) with 88 workers (58.7%). As for the BMI variable, the majority of workers had normal BMI with 116 workers (77.3%). In the variable of work shifts, the majority of workers work in risky shifts (night), which is as many as 76 workers (50.7%). In the physical workload variable, the majority of workers have a heavy physical workload, which is as many as 85 workers (56.7%). The variable of job stress, the majority of workers have severe job stress, which is as many as 64 workers (42.7%). Meanwhile, in the variable lighting intensity, the majority of respondents were at a safe/risk-free lighting intensity, which was 84 workers (56.0%). In the noise variable, the majority of workers were in areas that were safe/not exposed to noise, which was 114 workers (76.0%). Meanwhile, for the variable of work fatigue, it was dominated by mild work fatigue, which was 79 workers (52.7), but workers with severe work fatigue were not much different, namely 71 workers (47.3%).

Bivariate Analysis

Bivariate analysis was carried out on two variables that were suspected to have a relationship or correlation using the SPSS application, through tabulation techniques and *chi-square statistical tests*. The hypothesis was tested with a significance level of α (0.05).

Table 3. The Relationship of Independent Variables with Dependent Variables

Variable	Work Fatigue				Total		*P-value*
	Severe		Mild				
	n	%	n	%	N	%	
AGE							
Elderly (≥ 40 years)	66	79.5	17	20.5	83	100.0	0.000
Adolescent (< 40 years)	5	7.5	62	92.5	67	100.0	
LENGTH OF SERVICE							
Safe (≥ 5 Years)	68	77.3	20	22.7	88	100.0	0.000
Risky (< 5 Years)	3	4.8	59	95.2	62	100.0	
BMI							
Overweight	19	55.9	15	44.1	34	100.0	0.347
Normal	52	44.8	64	55.2	116	100.0	
WORK SHIFTS							
Risky (Night)	63	82.9	13	17.1	76	100.0	0.000
Safe (Day)	8	10.8	66	89.2	74	100.0	
PHYSICAL WORKLOAD							
Heavy	68	80.0	17	20.0	85	100.0	0.000
Light	3	4.6	62	95.4	65	100.0	
JOB STRESS							
Severe	49	76.6	15	23.4	64	100.0	0.000
Mild	22	25.6	64	74.4	86	100.0	
LIGHTING INTENSITY							
Risky	42	63.6	24	36.4	66	100.0	0.001
Safe	29	34.5	55	65.5	84	100.0	

NOISE							
Risky	15	41.7	21	58.3	36	100.0	0.555
Safe	56	49.1	58	509	114	100.0	
Total	**71**		**79**		**150**		

Source: Primary Data, 2024

Based on the results of bivariate analysis using the chi-square test, the results were obtained; There are 6 out of 8 independent variables that have a significant relationship with the dependent variable (work fatigue), namely the variables of age, length of service, work shift, physical workload, job stress, and lighting intensity, as verified by a p-value of < 0.05. Meanwhile, there were 2 variables that did not have a significant relationship with work fatigue, namely BMI and noise as evidenced by a p-value of > 0.05

Multivariate Analysis

The multivariate analysis used in this study was ordinal logistic regression analysis. The results from the previous bivariate analysis that showed significant values were subjected to multivariate testing again using ordinal logistic regression. From the 8 variables that were analyzed bivariately, there were 6 variables that had a significant influence on the dependent variable (work fatigue). Therefore, these 6 variables were subjected to multivariate analysis. The following are the results of the multivariate analysis using ordinal logistic regression.

Table 4. Partial Test Results (Parameter Estimates)

	Estimate	Std.Error	Wald	df	Sig
Thereshold					
Fatigue	11.775	2.359	24.909	1	0.000
Location					
Work Shifts	1.773	0.647	7.512	1	0.006
Age	1.961	0.739	7.036	1	0.008
Length of Service	2.009	0.884	5.161	1	0.023
Workload	1.838	0.850	4.682	1	0.030
Lighting	-0.581	0.653	0.790	1	0.374
Job Stress	-0.056	0.644	0.007	1	0.931

Source: Primary Data, 2024

The partial regression coefficient test is used to examine the role of regression coefficients from each independent variable individually that must be in the model using the Wald test statistic (Furchan, 2007). In table 3, it was found that the significant values were 0.006 for work shift variable, 0.008 for age variable, 0.023 for length of service variable, 0.030 for workload variable, 0.374 for lighting variable, and 0.931 for job stress variable.

Based on the variable analysis results, only work shift, age, length of service, and workload variables had values < 0.05. Therefore, it can be concluded that only work shift, age, length of service, and workload partially affected work fatigue significantly. Meanwhile, other variables partially did not have a significant effect on work fatigue.

DISCUSSION

Work Shifts

This research shows a significant influence between work shifts and work fatigue, proven by a p-value of 0.006 < 0.05. Based on the regression analysis results, an estimate value of plus 1.773 was obtained, which means the higher the work shift risk, the higher the risk of workers experiencing work fatigue. According to research findings conducted by Grandjean, it was found that night shift workers generally have poor health. They usually suffer from digestive disorders and feel anxious or nervous. This is caused by chronic fatigue and unhealthy eating and drinking habits. This chronic fatigue manifests as loss of vitality, feelings of depression, irritability, and exhaustion even after sleep. This condition is usually accompanied by psychosomatic disorders, such as loss of appetite, sleep disorders, and digestive disorders. Therefore, the anxiety experienced by night shift workers stems from chronic fatigue which, when combined with unhealthy eating habits, can lead to digestive diseases. [6].

Another research that is in line with this study is the research conducted by Marsela, et al. (2020) using the Mann-Whitney U Test obtained a p-value of 0.000 which shows a significant difference in the average work fatigue between the morning and evening shifts. With these differences, it can prove that there is a relationship between work shifts and work fatigue [7].

From this analysis, it can be seen that among the morning/day and night shifts that have the highest level of fatigue are found in the night shift because of the long working hours reaching 9 hours in one shift, as well as the lack of sleep time resulting in workers often being sleepy and wanting to lie down. It is known that bedtime during the day is not as effective as at night [8].

The limitation of working hours showed some efficacy in reducing fatigue, they did not completely reduce the risk of fatigue during working hours, but pointed to the need for a more comprehensive fatigue management strategy [9].

Age

Based on the results of the research that has been conducted, it shows that there is a significant influence between age and work fatigue as evidenced by a p-value of 0.008 < 0.05. Based on the results of the regression analysis, an estimate value of plus 1,961 was obtained, which means that the higher the age of the worker (elderly), the higher the risk of workers experiencing work fatigue. High work fatigue most commonly occurs in workers aged >40 years at 31.2%. Workers who are >40 years old will experience work fatigue more quickly compared to relatively younger workers, because older workers have experienced a decline in body activity, as a person's age increases, their body strength or muscle mass decreases, making them more susceptible to work fatigue [10].

The results of this study are in line with research that has been conducted by Kirana Edward in 2022 on the relationship between heat pressure, age and gender on feelings of work fatigue in charcoal briquette production workers at CV Harico Serut Madurejo Prambanan Sleman Yogyakarta stated that there is an age relationship with work fatigue because the older a person is, the lower the level of muscle work which can cause the body to feel tired [11].

This research finding aligns with the study conducted by Amin et al., (2019) which showed that there is a significant relationship between age and work fatigue among field workers at PT Pelabuhan Indonesia Bitung Branch. This is because a person's age affects their body's condition and capacity to perform their work. If someone is elderly, their ability to perform heavy work will decline, and older workers more easily feel tired and do not move as agilely when performing their tasks [12].

However, there is another study that found different results. Research conducted by Rino et al. in 2020 stated that the relationship between age and work fatigue obtained a p-value = 0.299, which means there is no relationship between age and work fatigue among workers [13]. There is a similar study that also states there is no significant relationship between age and work fatigue [14].

Based on the research conducted, the results of bivariate analysis on age and work fatigue variables show that the number of workers who have an old age is more compared to workers with a younger age, and it is known that workers with the elderly experience more work fatigue. Based on

the results of the study using *the chi square* test, there is a significant relationship between the age of workers and work fatigue.

From the results of the research carried out, we can conclude that the age factor is related to work fatigue, the older a person is, the lower the physical strength they have [14].

Length of Service

Based on the results of the research that has been carried out, it is found that there is a significant influence between the length of service and work fatigue as evidenced by the p-value of 0.023 < 0.05. Based on the results of the regression analysis, an estimate value of plus 2,009 was obtained, which means that the longer the worker's length of service, the higher the risk of workers experiencing work fatigue. Based on the results of research conducted by Manuaba (1992) in his theory states that the longer a person works, the more familiar the work will arise so that it affects the body's resistance to fatigue experienced. The length of work or it can be called a working period or length of service is an accumulation of a person's working time in a certain period. The employment period can also be interpreted as a period of time used by a person to devote themselves to their work until a set deadline [15].

This research is in line with research on workers of the Iron Rolling Unit of PT. X shows that there is a relationship between length of service and work fatigue. Workers who experience fatigue have a length of service more than 5 years. This can happen because the age of the worker is correlated with the length of service, the older the worker's age means the worker has a longer length of service [16].

In line with the research conducted by Perwitasari and Rohim Talueka (2017) regarding the effect of length of service & work shift on work fatigue in inpatient nurses at PKU Muhammadiyah Surakarta hospital which added that there is a relationship between length of service and work fatigue in nurses at PKU Muhammadiyah Surakarta hospital [17].

Research conducted by Damopoli states that, it is known that the length of service has a relationship with work fatigue and moderate relationship strength (r=0,443). The duration of work is also related to the level of fatigue in a person, because the activities carried out continuously that are received every day result in increased fatigue. This is also in line with research conducted by Maurits explaining that the length of service is related to the level of fatigue in workers because the longer they work, the higher the level of fatigue received which causes a sense of boredom. Another theory says that along with the length of a person's length of service, it will increase a person's expertise in doing the job [3].

Based on the results of field observations, the majority of respondents have passed the length of service for 2 years, a person's length of work can also affect work fatigue. A 2-year length of service is a long time for a worker to adjust and adapt to daily activities at work. From this analysis, it can be seen that the longer a person works, the more the body adjusts to fatigue. This is because the longer a person works, the sense of adaptation to work affects how well his body fights natural fatigue [18].

Workers who are still relatively new, many of them have not been able to adjust to the busy working hours and have not been able to arrange enough rest time. Meanwhile, many workers with a long length of service experience boredom while working, meaning that many workers are bored with work as a result of work that is too monotonous. This statement is in line with previous research which stated that there was a significant relationship between length of service and work fatigue in the PT. Elnusa Petrofin Banjarmasin. Workers with a length of service of ≥ 3 years, experience more fatigue than workers ≤ 3 years old. The highly significant p-value of 0.000 (P<0.05) indicates a strong correlation between length of service and fatigue [19].

Physical Workload

Based on the research and statistical analysis, there is a significant influence of physical workload on job fatigue, as evidenced by a p-value of 0.030 < 0.05. These findings are consistent with previous

studies on physical workload and job fatigue, such as research conducted on batik workers in Sragen, which demonstrated a significant relationship between workload and fatigue among Brotoseno Marasan Sragen batik workers. Additionally, research conducted on other informal workers, specifically those in the melinjo chip industry in Desa Benda, Indramayu, revealed a significant correlation between workload and work fatigue. [20], [21].

Based on the results of the regression analysis, an estimate value of 1,838 indicates a plus value, which means that the higher the worker's workload, the more work fatigue will also increase. It is also evidenced by the p-value obtained which is 0.030 < 0.05 which states that there is a significant influence between workload and fatigue. This study is in line with the research conducted by Kusuma 2017 stating that the correlation coefficient (r) = 0.416 means that there is a relationship between workload and moderate work fatigue and the direction of positive correlation means that the higher the workload, the higher the incidence of work fatigue will also be, this can be said that there is an effect of physical workload on work fatigue in workers [22]. In addition to physical workload, there are various factors that can cause fatigue. Fatigue can be affected by age, lifestyle, work experience, overtime and work shifts [23]**.**

Another research that is in line is the research that has been conducted by Permatasari, et al. (2017) and Safitri (2017) which states that there is a relationship between workload and work fatigue. The work done by the respondents in processing tofu requires physical strength. The physical workload perceived by respondents includes heavy workloads [24].

Lighting Intensity

Based on the results of the research that has been carried out, it is found that there is no significant influence between lighting intensity and work fatigue as evidenced by a p-value of 0.374 > 0.05 or has a very small effect between lighting intensity and work fatigue. When testing the relationship in the bivariate analysis, it was found that there was a significant relationship between exposure intensity and work fatigue with a p-value of 0.001 < 0.05.

Lighting that falls below the threshold value (NAB) creates an additional burden for workers, potentially causing performance disruptions that ultimately can affect occupational health and safety. This is closely related and absolutely necessary because it involves the function of visual senses, which can affect worker productivity. Additionally, according to Sutalaksana (2006), one of the factors that can cause fatigue in a person is room lighting that is below the NAB. Therefore, every workspace needs to be designed with lighting intensity that complies with the NAB to support workers' work processes in producing perfect output [25].

Based on the results of the regression analysis, an estimate value of minus (-0.581) was obtained which indicates the opposite direction, meaning that the lower the lighting intensity, the higher the risk of workers experiencing work fatigue. The results of a study conducted by Maurits 2020 showed that there was an effect between lighting intensity on nurse fatigue in the Emergency Department of Rote Ndao Regency Hospital in 2008. This is in line with the results of Hendrawan's (2003) research which states that good and adequate lighting can reduce the level of work fatigue in the star-rated hotel accounting workforce so as to increase productivity, and vice versa, the lower the intensity of lighting, the higher the risk of work fatigue. In addition, the results of this study are also in line with the results of Hambali's (2004) research which stated that there was a positive relationship between the level of lighting and the eye fatigue of embroidery craftsmen [26].

Based on the results of observation of the research location, it was found that the number of light points in each room was sufficient but many lights were turned off while working. As a result, the intensity of the existing lighting is reduced, due to the uneven distribution of light. According to Siswanto (1993), the uneven distribution of light causes the eyes to be forced to adjust to various glare contrasts so that fatigue will occur faster [27].

Sufficient and well-regulated lighting will also help create a comfortable and pleasant work environment so that it can maintain enthusiasm for work. It is known that almost all work execution

involves eye function, each type of work requires a certain level of illumination so that workers can clearly observe the object being worked on. Lighting intensity that suits the type of work certainly increases work productivity [28].

Job Stress

Based on the results of the research and statistical analysis of regression, it was shown that there was no significant influence between job stress and work fatigue as evidenced by a p-value of 0.931 > 0.05 or had a small effect between job stress and work fatigue. It will still be when testing the relationship in the bivariate analysis, it is stated that there is a significant relationship between job stress and work fatigue with a p-value of 0.000 < 0.05. This study is in line with previous research, namely with the results of the test obtained *a P value* of 0.03, so that the *P value* < 0.05. Based on statistical tests, it can be concluded that there is a significant relationship between job stress and work fatigue in workers, informants who suffer from work fatigue are 5.2 times at risk of stress in workers with the lowest vulnerability to occurrence of this opportunity is 1,068 and the highest vulnerability is 25,309 [29].

Based on the results of statistical analysis of the estimate value between job stress and work fatigue, a minus value (-0.056) indicating an inverse direction, which means that the higher the stress level in workers, the lower the fatigue in workers will be. Siagian defines stress as a condition of tension that affects a person's emotions, way of mind, and physical condition [30]. These events can support strategies for sleep improvement and can prevent the negative progression of sleep problems and work fatigue [31]**.**

This research is also in line with the previous research, conducted by Ratih (2012) on the workforce of the weaving section of PT. Iskandar Indah Printing Textile. The study explained that there is a significant relationship between work fatigue and job stress. The high level of attention required to supervise 12 high-speed looms simultaneously, coupled with the precision needed for threading these looms, creates a demanding work environment that increases the risk of errors. The weaving part requires precision to insert the thread into the machine [32].

Body Mass Index (BMI)

Based on the results of research and statistical analysis, it was found that there was no significant relationship between BMI and work fatigue as evidenced by a p-value of 0.347 > 0.05. This study is in line with the results that show that there is no relationship between nutritional status and fatigue in workers making pipes and offshore mooring towers. This explains that normal or abnormal nutritional status experiences the same fatigue [33]. This result is also supported by the results of observations, it was found that most of the workers have fulfilled their nutritional status because of the provision of canteen facilities in the work area.

The results of this study are also in line with the research conducted by Dirgayudha, 2014 that based on the results of statistical analysis, it was found that there was no significant influence between nutritional status and work fatigue. However, a worker with good nutritional status will have better endurance and work capacity [34].

There are several differences with other studies that state that there is a significant difference between BMI and work fatigue, The results of the study show that there is a relationship between Nutritional Status and Work Fatigue Level in the Metallurgical Unit of Mentok PT. Timah Tbk with p-value = 0.000 (p value < 0.05). Worker nutrition, which is the main source of energy for workers to do work, is a crucial variable because it can affect the performance of workers and improve the quality of work of the workers themselves. If the nutritional status is excessive (obese), this will result in problems with the body's metabolism so that when workers do their work, they will experience fatigue faster [35].

Although the results of the study did not show a significant result between BMI and work fatigue, BMI should still be a special concern. Being overweight has become a growing health challenge in various parts of the world. This problem not only affects a person's health, but also has a big impact on performance at work. Individuals who are obese tend to experience a decrease in work efficiency and effectiveness, and are more often absent from work due to accompanying health problems. This certainly has a bad effect on the company's overall performance.

Noise

Based on the statistical analysis, there was no significant correlation between noise exposure and work fatigue, as indicated by a p-value of 0.555 > 0.05. These findings align with observations made during the study, which suggested that noise levels in the workplace were generally low due to the distance between workstations and noisy areas. However, some workers reported experiencing noise-related discomfort when working in areas closer to noise sources.

This study is in line with the previous study, which obtained a p-value of 0.864 which means that there is no relationship between noise level and work fatigue in production workers. This is also in line with research conducted by Dirgayudha 2024, that the noise level factor in the workplace has no relationship with work fatigue. In this study, it was possible because most workers were only exposed to noise in the range of 80 dB, which includes exposure to low noise [36].

Although the results did not show a significant relationship, noise should not be underestimated. Noise will cause fatigue in workers if they are constantly exposed. Workers who are exposed to noise will have an increased pulse, blood pressure will rise and narrow blood vessels so that they quickly feel tired. According to Syukri (1996) stated that noise interferes with concentration, communication and thinking skills [37].

5. Conclusion

Based on the results of the relationship test analysis using the chi-square test, it was stated that there were 6 out of 8 independent variables that had a significant relationship with dependent variables (work fatigue), namely variables of age, length of service, work shift, physical workload, job stress, and lighting intensity, as evidenced by a p-value of < 0.05. Meanwhile, there were 2 variables that did not have a significant relationship with work fatigue, namely BMI and noise, as evidenced by a p-value of > 0.05.

Meanwhile, based on the results of the regression test, it was found that there was a significant influence on the variables of work shift, age, length of service, and workload with a p-value of < 0.05, while the variables of lighting and job stress did not have a significant influence with a p-value > 0.05. So, it can be concluded that only work shifts, age, length of service and workload partially affect work fatigue significantly. Meanwhile, other variables partially only have a small effect on work fatigue.

6. Acknowledgements

The researcher would like to thank the supervisors from the faculty of public health, department of occupational safety and health Hasanuddin University. To all participants who have participated in this study. As well as family and friends who have provided support during the research, so that this research can be carried out properly.

7. Conflict of Interest

There is no conflict of interest in this study

8. Funding

This study did not receive external funding

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