



**DIFFERENCES IN FATIGUE LEVELS BASED ON WORK SHIFTS IN
CONCRETE PRODUCTION WORKERS**

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ABSTRACT

The increase in demand for concrete raises demands for high production needs so that complaints of fatigue arise in workers. In an effort to minimize fatigue felt by workers, the company implements a shift system at work. The purpose of this study was to determine the difference in fatigue levels based on work shifts in concrete production workers of PT. Maxima Daya Indonesia. This study used quantitative methods with a cross sectional design. The population in this study was all workers with a sampling technique, namely a total sampling technique of 104 respondents. The variables studied in this study were shift work and work fatigue. The data will be tested for normality and homogeneity and then analyzed using a t-independent test to determine the difference between the two variables that are statistically meaningful. The results of this study showed a significant difference between the average fatigue in the morning shift with the night shift ($\text{sig} < 0.005$) with the mean in the morning shift of 32.33 while the mean in the night shift was 38.56. Fatigue in the night shift caused by night shift work activities tends to be the same as the morning shift and disrupted workers' rest patterns.

Keywords: fatigue; rest; shift work

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INTRODUCTION

Fatigue is a protective mechanism of the body to keep it from further damage after doing activities or work so that recovery is needed by resting the body (Boekoesoe et al., 2021). Work fatigue refers to feelings of fatigue and bodily discomfort that occur due to prolonged work activities. Work fatigue usually indicates different conditions from individual to individual, but it all boils down to loss of efficiency and decreased work capacity and endurance (Iriyani Malik et al., 2021) Work fatigue is a problem that is often felt by workers where shift work is a factor that affects the occurrence of fatigue in workers (Marsela G. Solang, Paul A. T. Kawatu, 2020). By National Safety Council (2023) Fatigue due to excessive activity is the cause of workers missing work the most during 2021-2022. Fatigue becomes a serious thing because it is one of the risk factors that contribute greatly to the occurrence of work accidents that cause death and fatigue will increase with increasing work time (Aslan et al., 2022).

Work fatigue will have an impact on decreasing work productivity, work motivation, work performance and worker health. Often fatigue is the cause of work accidents. Fatigue will also affect the production produced so that it will affect the company's profits. There are many factors that influence fatigue such as shift work, work time, rest period, age, working period

and nutritional status (Lestari et al., 2023). Globalization causes industries in various sectors to experience rapid progress which is assisted by the application of production equipment and machine technology and to maximize the work of the industrial sector can use the pattern of division of work shifts. Shift work is a system implemented by companies to increase productivity to the maximum for 24 hours. In Indonesia, there are an average of 3 work shifts used, including morning, evening, and night shifts (Poniah Juliawati, 2020). Shift work affects work fatigue because it makes workers' lifestyles irregular when running work shifts (Mustain et al., 2022).

Based on Law No. 13 (2003) on Manpower explains that all companies are required to apply working time provisions for their workers including by working no more than 7 to 8 hours per day and with the application of overtime that is not more than 3 hours per day and 14 hours per week and companies must obtain agreement from related workers. Likewise, the application of rest periods between working hours for workers who have worked for 4 hours should get at least half an hour. Work shifts significantly affect the onset of work fatigue, especially in the division of morning and night work shifts. In the morning shift, fatigue occurs due to work activities, while in the night shift, workers will experience considerable fatigue due to work activities and changes in the life cycle that should rest at night, so that it can add to the fatigue factor of night shift workers (Maulani et al., 2020).

Companies can provide additional shifts to reduce fatigue in workers, build canteens with balanced menus and design tools to reduce the burden on workers so that the level of fatigue in workers will decrease (Arfan & Firdaus, 2020). Reducing fatigue can be done by dividing work shifts into 3 shifts, namely morning, evening, and night (William et al., 2022). PT. Maxima Daya Indonesia is a company engaged in the production of various types of concrete. The company produces ready mix and precast concrete (water channel concrete, electricity pole concrete, earth nail concrete and so on). The increase in demand for concrete generally occurs at the end of the year which raises high production demand demands resulting in complaints of fatigue in workers. In an effort to minimize fatigue felt by workers, the company implements a shift system at work.

PT. Maxima Daya Indonesia implements two work shifts, namely morning and night shifts. Each shift has a duration of 8 working hours and changes of worker shifts are carried out once a week. Working time in the morning shift starts at 08.00 – 16.00 WIB while the night shift starts at 16.00 – 24.00 WIB. The company has a large open space area but the production process is carried out in buildings that have roofs so as to keep workers protected from exposure to solar heat while working. In producing concrete workers in the company PT. Maxima Daya Indonesia has involved technological advancements, but there is still a lot of work that is still done manually because it must be done in detail. Working using assistive devices or not using assistive devices has the potential to experience burnout in workers. Therefore, the purpose of this study is to determine the difference in fatigue levels based on work shifts in concrete production workers of PT. Maxima Daya Indonesia.

METHOD

This study used quantitative methods with a cross sectional design. This research was conducted at PT. Maxima Daya Indonesia. The time of the study will be in February 2024. The population in this study was all workers with a sampling technique, namely a total sampling technique of 104 respondents. The variables studied in this study include independent variables are morning and night work shifts, then the dependent variable is fatigue in PT production workers. Maxima Daya Indonesia. This study used primary data

sources obtained directly. Data collection method using questionnaire instruments in the form of questionnaire sheets. This study measured subjective fatigue using the Subjective Self Rating Test method from the Industrial Fatigue Research Committee (IFRC) with categories of worker fatigue, namely low, medium, high and very high. The research instruments used have been carried out normality tests using Levene and homogeneity tests using Kolmogorov-Smirnov. In the normality test using Levene was declared valid with morning shift fatigue values of 0.058 ($p > 0.05$) and night shift fatigue of 0.200 ($p > 0.05$). While the homogeneity test using Kolmogorov-Smirnov on the data was also declared valid with a value of 0.211 ($p > 0.05$). The data was then analyzed using 2 types of statistics, namely univariate analysis to describe the frequency distribution of variables then bivariate analysis using a t-independent test to determine there were differences between the two variables that were statistically meaningful.

RESULTS

Table 1.
Variable Frequency Distribution (n=104)

Variable	f	%
Age		
Late Adolescence (17-18 years old)	5	4,8
Early Adult (26-35 years)	82	78,8
Late Adult (36-45 years old)	17	16,3
Education		
High School / Vocational School	89	85,6
Bachelor	15	14,4
Body Mass Index (BMI)		
Usual	61	58,7
Fat	33	31,7
Obesity	10	9,6
Period of Service		
1-5 Years	63	60,6
6-10 Years	41	39,4
Working Time		
8 Hours	71	68,3
9 Hours	21	20,2
10 Hours	12	11,5
Break Time		
30 Minutes	23	22,1
60 Minutes	81	77,9
Shift Work		
Morning	52	50
Night	52	50
Work Fatigue Rate		
Medium	92	88,5
High	12	11,5

Table 1, the study primarily focuses on early adult participants, comprising 78.8% of the respondents, followed by late adults at 16.3%, and late adolescents at 4.8%. Educationally, the majority of respondents, accounting for 85.6%, hail from high school or vocational backgrounds, with only 14.4% having attained higher education. Body Mass Index (BMI) calculations reveal that 58.7% fall within the normal range, 31.7% are categorized as fat, and 9.6% fall into the obesity category. Regarding work-related factors, most respondents have a working period of ≤ 5 years (60.6%) and work an 8-hour shift (68.3%). Furthermore, a significant majority (77.9%) have a rest period of 60 minutes, and an equal distribution between morning and night work shifts is observed. Regarding work fatigue, the majority (88.5%) report a medium level of fatigue, with a minority (11.5%) experiencing high levels.

Table 2.

T-independent test results between differences in fatigue levels based on work shifts

	Shift Work	Mean	SD	Sig (2-tailed)
Fatigue	Morning Shift	32.33	5.032	.000
	Night Shift	38.56	5.873	.000

Based on the results of the *t-independent test*, the average work fatigue in the night shift was higher at 38.56 with a standard deviation of 5,873 compared to the morning shift, which was an average of 32.33 with a standard deviation of 5,032. The results of the *t-independent test* obtained Sig values of $0.000 < 0.05$ can be concluded that there is a significant difference between the average fatigue in the morning shift and the night shift.

DISCUSSION

Based on the results of the study, it shows that there is a significant difference in fatigue between morning shift workers and night shifts in concrete production workers with a value of $p < 0.05$, which is 0.000. This study showed a significant difference between morning shift fatigue with a mean of 32.33 then night shift fatigue with a mean of 38.56. Fatigue in night shift workers is relatively greater due to work activities, rest periods and work time. This research is in line with research conducted by (Hangkoso et al., 2024) which shows a significant difference in fatigue in morning and night shift workers with $P < 0.05$ which is 0.008 with Mean Total 58.68 where the level of fatigue in the night shift is higher than in the morning shift, this is because at night is a time for humans to rest and when that time is used for work it will disrupt the rhythm of waking up and sleeping someone. Likewise with research conducted by (Suryadi, 2022) which states that there is a difference in the level of work fatigue between the morning shift and the night shift with a value of $p = 0.036$ ($p < 0.05$), this occurs due to lack of rest in night shift workers because there are many disturbances when they want to rest in the morning or afternoon such as social and family activities. The same thing happened to research conducted by (Bestari & Hariyono, 2020) which uses statistical tests Mann Whitney Test Getting the difference in the average fatigue score where $p = 0.001 < 0.05$, so there is a difference in fatigue scores between the morning shift and the night shift that occurs due to forcing the body not to rest at night.

In production activities, the company has involved technological assistance such as the process of moving materials such as stone and sand which have been assisted by heavy equipment (Wheel Loader) and concrete lifting equipment or concrete mold (Hoist Crane). However, there are still concrete production processes that still require manual work activities such as the concrete leveling process, concrete mold precision process, concrete mold cleaning, concrete watering and others. Production activities are carried out in the morning until night. This is in accordance with research conducted by (Hesti Suliastiani, et.al, 2023) which states that often night shift workers also have to carry out work activities like morning shifts so that workers experience fatigue. Based on this study, it was found that many night shift workers experience symptoms of fatigue such as workers' desire to lie down, drowsiness and yawning while working. Night shift workers will generally take long breaks in the morning until noon. But taking a break at that time will be difficult to do. This is according to research (Agustiana et al., 2023) who think that sleeping in the morning or afternoon will be disturbed by noise, temperature, bright conditions, and body metabolism such as hunger or urination and this causes night shift workers to feel sleepy, anxious, not concentrating and easily forgotten during work. The same was conveyed by (Afifah et al., 2021) which states that when working on the night shift the body will experience changes in sleep patterns which can cause workers on the night shift tend to be more easily sleepy, feel tired quickly, irritable and more easily forget. Other negative effects due to poor sleep quality can also cause a

tendency to be anxious and unable to concentrate while working (Budyawati et al., 2019)

Based on this study, it was found that some workers work longer than normal times. This is according to research (Ardianti et al., 2023) That the increase in demand for concrete production makes production activities last from morning to night, causing complaints of fatigue in workers due to long working time to reduced rest periods. On research (Ratih et al., 2020) It also said many workers work longer hours than normal times in the hope of earning higher wages or salaries later and some workers consider increased working hours to be common. Like research (Kuku et al., 2022) Which explains the emergence of the view of fatigue that workers experience is common because everyone will also definitely experience fatigue, then think fatigue only causes thirst, drowsiness, and soreness in certain areas, so they do not care about the fatigue itself and continue to work but they do not know that the symptoms of fatigue will lead to many problems such as accidents with the worst possibility being death.

In this study also found some workers who have a risk of fatigue caused by age, length of work and nutritional status of workers. There are many workers belonging to the late adult age group with an age range of 36-45 years who experience high levels of fatigue. There are many workers who belong to the group of long working period, which is more than 5 years. And found many workers who have abnormal nutritional status. On research conducted by (Dahlan et al., 2023) Explaining that age will affect the condition of the body, someone who is young will be strong enough to do heavy work and vice versa someone who is old then the ability to do heavy work will decrease, elderly workers will feel tired quickly and not agile in moving when carrying out their work so that it affects their performance. On research conducted by (Rusila & Edward, 2022) Stating the same thing also happens to workers with long working periods will be injured more feel fatigue. On research conducted by (Habibie Alfahmi & Zuhairsyah Faris, 2023) That the nutritional status of workers also affects fatigue, where workers with underweight or underweight nutritional status tend to experience fatigue more easily due to limitations or unavailability of nutrient reserves which will be converted into energy during activities. No different from someone who has fat nutritional status, they also quickly experience fatigue because there is an accumulation of fat in the body so that they experience obstacles in carrying out their functions.

CONCLUSION

Based on the research that has been done, it can be concluded that there is a significant difference in fatigue between morning shift workers and night shifts in concrete production workers with a Sig value of <0.05 , which is 0.000. with the highest mean fatigue in the night shift of 38.56. In the morning shift, fatigue occurs due to work activities and the same is felt by night shift workers, but workers will be more tired due to changes in rest patterns.

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