Research Article

ANALYSIS OF DIFFERENCES IN WORK FATIGUE BASED ON GAS STATION OPERATOR WORK SHIFT

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ABSTRACT

Operators of public refueling stations (SPBU) are exposed to continuous fatigue obtained after work where one of the factors is excessive working hours. Operators at three Ponorogo gas stations have three different work shifts, where the working hours between the three work shifts are different, with night shifts that have the longest working hours, namely 10 working hours, and day shifts with the fastest working hours, namely 7 working hours. Excessive working hours can result in negative effects on gas station operators, including increased fatigue and unhealthy living behaviors, reduced performance and reaction time, thus increasing the likelihood of injury and accidents. The purpose of this study was to look for differences in work fatigue between the three work shifts applied by ponorogo regency gas stations. Researchers used random sampling to 46 operators at 3 gas stations in Ponorogo. Data collection techniques use the Sweedish Occupational Fatigue Inventory (SOFI). The analysis used the Annova One-way test (p<0.005). The results showed a significant difference in work fatigue between the three work shifts with (p-value <0.005). The conclusion was the difference in work fatigue of gas station operators between the three work shifts, with the highest fatigue rate in night shifts.

INTRODUCTION

The term "24 hours society" has been known in the community as a form of service at any time such as in hospitals, fire services, industry, call centers, police and others.[1] Some industries had 24 hours per day because the need for the production process requires continuous sustainability and takes a long time. One of them is a Fuel Filling Station or gas station that uses an engine with a long set and at a high cost. In the 24-hour operation time, of course, there is a work shift, where shift work is a pattern of working time given to the workforce to do something by the company and is usually divided into morning, afternoon, and evening work. The schedule of work shifts that apply varies greatly. It is usually an 8-hour work shift or 12 hours a day.[1]

About one in five workers in Europe work with a shift system, particularly in a "24-hour" workplace. The shift system itself usually has a working period of 6 to 12 hours at a time by dividing the worker into two, three, or four shifts in 24 hours. Three shifts usually start from 06.00, 14.00, and 22.00. Some workers only work the day shift, some others are only night shifts, while there are also workers who rotate between 3 working shifts. Extended working hours generally mean working more than 48 hours in one week, either at daily work or shift work or either because of the high number of working hours per day or the high number of working days in one week.[2]

At this time, shift work is a job that involves working hours outside of 8 hours of daily work. Shift work has been implicated as one of the factors of several chronic diseases, such as cancer and cardiovascular disease. Shift work is associated with several problems such as reduced productivity, personal disturbances as well as social life, and work fatigue.[3] Work fatigue is one of the most considered things in some countries

that have high levels of the industry. The consequences of work fatigue are significant, and can affect national and personal productivity, occupational safety and health, personal health and well-being costs. Work fatigue not only occurs in the industry but also occurs in the service and service sectors, such as police, nurses, firefighters, and gas station operators.[4]

About 15% to 20% of the workforce in industrialized countries now engage in night work or rotating shift work, a phenomenon that occurred due to the discovery of artificial light in the 19th century. When humans disrupt their normal life cycle, as well as the light and dark cycle or so-called LD cycle, where they try to control the circadian rhythm which includes the human wake and sleep cycle, and this results in internal desynchronization between circadian rhythm and sleep. About 40% and 80% of industrial workers on night shifts report disrupted sleep time compared to only 10% to 15% of workers on day shifts. The most widespread and severe impact of desynchronization due to shift work is a decrease in the quantity and quality of sleep. Sleep time for shift workers is reduced by 1 to 4 hours, with reductions mainly affecting stage 2 and REM sleep.[5]

The gas station is one of the workplaces that implements a shift system. Fatigue levels in workers with shift work are higher than in workers without shift hours. Workers at the gas station spend more than half of their working time in a standing position. Standing position for a long period is one of the causes of work fatigue. Unsafe behavior in gasoline filling operators (due to work fatigue) can increase the risk of accidents at work. Physical demands vary across gas stations. So, physical and mental fatigue is most likely to exist among workers at gas stations and work fatigue assessments are very important to understand the consequences of high-risk workplace fatigue such gas stations.[3] Prolonged working hours can be associated with increased fatigue and unhealthy living behaviors, reduced performance and reaction time, thereby increasing the likelihood of injury and accidents.[3]

There are many studies that have discussed work fatigue and work shifts, but not many have studied work fatigue with work shifts at gas stations, where work fatigue at gas stations is more at risk with excessive working hours and the absence of SOP time off, and here the author wants to research the difference in work fatigue based on work shifts at Ponorogo regency gas stations.

METHOD

This study used an observational analytical research design with a cross sectional approach, where data on factors affecting work fatigue in workers of the General Refueling Operator (SPBU) in Ponorogo Regency was collected at the same time and carried out at one time only.

This research carried out at Ponorogo Regency Gas Station consisting of 3 gas stations, namely Sinduro Gas Station, Jetis Gas Station, Jingglong Ponorogo Gas Station. The research variables include: Shift work (independent variable) and work fatigue (dependent variable).

The research was conducted at 3 times of 24-hour gas stations in Ponorogo Regency, with 46 filling operators. With work consisting of: serving consumers in filling fuel, maintaining environmental fatigue and tools, carrying out daily maintenance activities for pumps, tanks, and generators, carrying out routine cleaning of all facilities in the gas station complex.

Measurement of work fatigue using the Swedish Occupational Fatigue Inventory (SOFI) method.[6] The SOFI questionnaire is used to subjectively measure work fatigue, which has 5 dimensions of fatigue, namely lack of energy, exerting physical exertion, physical discomfort,

lack of motivation and drowsiness. Where the 5 dimensions have 5 questions, so the total questions in the SOFI assessment are 25 question points. The assessment on this questionnaire is to use a scale of 0 to 6 with an interpretation of the value of 0 means that the statement is not felt at all, while the value of 6 indicates that the statement is strongly felt by respondents. How to calculate the total score is to sum the scores in each dimension. So the minimum score of each dimension is 0 which shows that the respondent does not feel fatigue at all and the maximum score is 30 which means that the respondent is very tired due to work. As for the category of work fatigue levels by looking at the number of scores according to the SOFI questionnaire, among others; mild (1-50), moderate (50-100), and severe (101-150) categories (**Table 1**). The question number of each component can be seen from the **Table 2**.

The data analysis used in this study is a difference analysis. Data is presented in the form of percentages when the type of data is categorical, namely work shifts, work fatigue levels. The type of numerical data and the distribution of normal data is presented in the form of mean and standard deviation i.e. indicators and total scores of fatigue questionnaires. Data test using the One-way ANOVA test. The variable analyzed in this study measured in this study was the level of work fatigue in gas station operators. The analysis of two variables between work fatigue and work shifts is to use the One-way Annova test because in this study the variables of work fatigue scaled data ratios and nominal-scale work shift variables.

Table 1. Variable Operation

No	Variable	Operational Definition	Instrument	Objective Criteria	Data Scale
1.	Independent shift work	Work shifts: Shift 1: 07.00 wib – 14.00 WIB Shift 2 : 14.00 wib – 21.00 WIB Shift 3 : 21.00 wib – 07.00 WIB	Questionnaire	a. Shift 1: 07.00–14.00 WIB b. Shift 2: 14.00-21.00 WIB c. Shift 3: 21.00 -07.00 WIB	Nominal
2.	Dependent: Work Fatigue	A process of decreasing the functional capacity of the body so that the endurance and physical endurance of the body, efficiency and productivity of the operator's work decreases during, during, and completed work.	Questionnaire: *Swedish Occupational Fatigue Inventory (SOFI)*	Mild : 1- 50 Moderate : 51-100 Severe : 101-150[6]	Ratio

Table 2. Components and Question Numbers of SOFI[6]

Number	Component	Question number
1	Lack of energy	1 – 5
2	Exerting physical energy	6 – 10
3	Physical discomfort	11 – 15
4	Lack of motivation	16 – 20
5	Sleepy	21 – 25

RESULT

An overview of the frequency of respondents based on work shifts categorized into 3 categories, namely morning shifts, day shifts and night shifts. Total of 46 respondents, morning shifts amounted to 17 people (36.95%), day shifts amounted to 17

people (36.95%) and night shifts amounted to 12 people (26.09%). Frequency of respondents based on work fatigue categorized into 3 categories, namely light, medium and high. From the 46 respondents, the majority of operators experienced mild fatigue, with an average SOFI score of 35.92.

The number of operators in the morning shift who experienced mild work fatigue was 16 people and 1 person experienced moderate fatigue. Operators working the day shift experienced mild work fatigue amounting to 16 and 1 person with mild fatigue. Operators who worked in the night shift experienced moderate fatigue amounting to 8 people and those who experienced mild work fatigue amounted to 3 people and 1 person with severe fatigue (**Figure 1**).

The significant value (p value/ p value) in the One-Way ANOVA test of 0.002 which means that $p<0.05$ so that it can be stated that there is a significant difference in work fatigue between the three shifts. Based on statistical tests using Annova's one-way test and obtained the results that night shifts have a $P < 0.05$ against the other two shifts, it can be concluded that there is a significant difference in work fatigue on night shifts to morning shifts and day shifts, where the shifts that have the most impact on fatigue are night shifts (**Table 3**).

DISCUSSION

The gas station operator is someone who is in charge of operating the fuel filling machine at the gas station. Here are the factors that cause work fatigue based on work shifts and differences between work shifts in gas station operators. Shift work is the arrangement of working hours or work patterns that are scheduled and given to the workforce by the company which is usually divided into morning, afternoon, and evening work.[7] The implementation of work shifts at gas stations in Ponorogo Regency is carried out 3 shifts, namely morning shifts, day and night shifts. The shift is not in accordance with the application of rotating work shifts where shift changes start with morning shifts, namely 07.00 - 14.00, day shifts at 14.00 - 21.00, and night shifts at 21.00 - 07.00.[8] The work rotation applied by the gas station is a 3-3-3 work rotation system, namely 3 days of morning shift, 3 days of day shift and 3 days of night shift and 1 day off system in 1 month determined by the operator.

Good work rotation is 2-2-2, work in the morning twice and continued twice during the day and twice at night (this rotation is referred to as metropolitan rota) or 2-2-3 with morning work twice followed by day work twice and night work three times (also called continental rota).[9] Night shift work for 3 days in a row should be followed by a break of more than 24 hours or a break of 2 days. The work rotation used by the gas station is not included in the rotation of metropolitan rota 2-2-2 or continental rota which is 2-2-3. The working time of the morning and afternoon shifts carried out by gas stations in Ponorogo Regency is longer, roughly for 3 consecutive days in contrast to the existing theory that is carried out for 2 working days. There are no scheduled rest hours by the gas station. The rest time is carried out unstructured, namely when going to perform prayers with a time of 30 minutes which is done alternately between operators. There is no meal provided by the gas station, and there are no overtime working hours for gas station operators. All gas station operators work in accordance with the working hours set by the gas station.

The result of this study is that there is a significant difference in work fatigue from gas station operators in both morning shifts, day shifts and night shifts ($p = 0.00$; $p < 0.05$). The highest work fatigue is felt by the operator when doing work on the night shift. This is due to the work

fatigue received by different operators in each shift, as well as different working climate conditions in each shift. In addition, there is a huge difference in the number of hours worked.

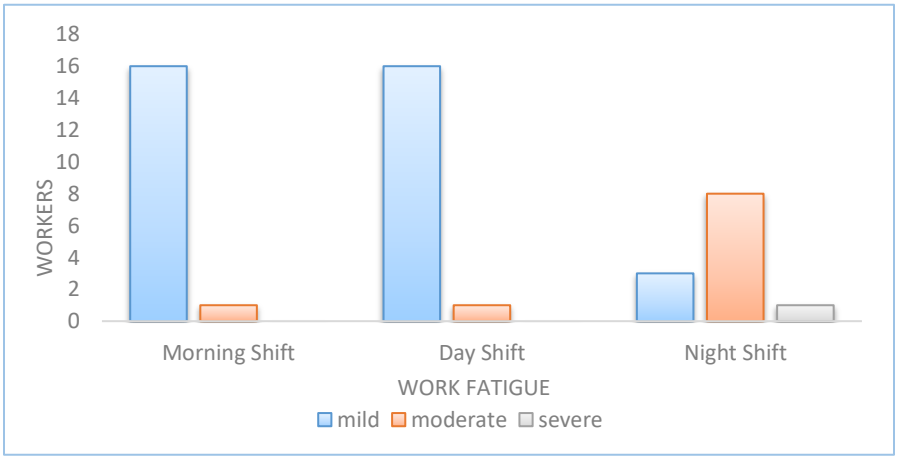

Figure 1. The difference between work shift variables and work fatigue at Ponorogo gas station operators

Table 3. Difference in work fatigue between morning, noon and night shifts.

Post-hoc Analysis	*p* value
Morning to night shift	0,005
Day-to-night shift	0,003
Morning shift with day	1,000

Based on the results of calculations and observations made by researchers, there is a difference in the number of hours worked in each shift. On the morning and afternoon shifts with 7 hours of work, while the night shift with 10 hours of work. The working time has exceeded the working hours stipulated in UU No. 21/2020 and article 21 paragraph (2) of Government Regulation No. 35/2021, which is 7 hours a day and 40 hours a week for 6 working days a week. In addition to the holiday time arranged by the gas station is 1 day off and 1 day of leave per month and unstructured, where the holidays are arranged by the operator themselves and alternate between fellow operators. Excessive working hours can cause a variety of health problems including mental, physical and social problems. Some of the more serious effects caused by excessive working hours are stress, lack of free time, poor time balance, deteriorating relationships, and serious health risks that cause fatigue, fatigue, obesity, insomnia, depression, diabetes, high blood pressure, Cardio Cerebrovascular problems, etc.[10]

CONCLUSION

There was a difference in work fatigue levels between morning, noon and night shifts in gas station operators in 3 gas station at Ponorogo Regency, with the highest average fatigue rate in night shifts 65,649.

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