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Fatigue analysis to driver of intercity in West Sumatra Province, Indonesia a case study of Padang – Bukittinggi – Payakumbuh route

Taufiq Ihsan[1]*, Yaumal Arbi[2], Andi Irawan[2] and Intan Purnama Sari[3]

[1] Department of Environmental Engineering, Faculty of Engineering, Universitas Andalas, **INDONESIA**
[2] Department of Civil Engineering, Faculty of Engineering, Universitas Negeri Padang, **INDONESIA**
[3] Department of Environment, West Sumatra Province, **INDONESIA**

*Corresponding author: taufiqihsan@eng.unand.ac.id

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Abstract—Traffic accidents were common problems in the implementation of a transportation system, including in West Sumatra Province, Indonesia. Traffic accidents that occur every year were the evidence by the number of traffic accidents that occur every year. One of the causes of traffic violations that result in accidents is the risk of driver fatigue while working. This study analyzed the work-fatigue in the driver of the Intercity in Province bus (AKDP) the scope of this study was all AKDP bus drivers with the origin of Padang City, Bukittinggi City, and Payakumbuh City. Measurement and analysis of work-fatigue were using the reaction timer to light response. The results showed that increasing the number of shifts would increase driver fatigue. 33.33% of drivers run into medium level of fatigue, and 38.89% of drivers run into heavy level of fatigue. The relationship between work-fatigue and the driver's shift correlated very strongly and positively with a correlation value of r = 0.81. The owner of the company needs to take measures to improve management to minimize the level of work on this driver that has the potential to cause traffic accidents.

Keywords: Accidents, Work-fatigue, Shift; West Sumatra

I. INTRODUCTION

Traffic accidents were common problems in the implementation of transportation systems. Recorded in 2018; there are 24,572 accidents in Indonesia, of which 3.02% occurred in West Sumatra Province (Korlantas Polri, 2017). The driving factor was often suspected to be the primary cause of accidents (Stutts JC et all, 2003). According to data from the Indonesian National Police Traffic Corps, the violation factor committed by the driver reached more than 80% of the causes of traffic accidents involving minibusses and buses, especially intercities in the province. One of the reasons for traffic violations is the risk of fatigue at work which can reduce the level of concentration and disrupt the health of the driver for a long time. Factors affecting the driver's fatigue level, one of which comes from the driver's working hours (Budiono, Jusuf, and Pusparini A, 2003).

Excessive working hours result in fatigue. Fatigue is a condition where a person feels very tired, tired or sleepy due to lack of sleep, prolonged physical and mental work, or feelings of excessive stress and anxiety. Tedious or repetitive work can increase feelings of fatigue. Long working hours, continued physical and psychological activity, lack of rest time, insufficient rest, excessive stress, chronic health conditions, monotonous work can trigger fatigue (Tarwaka, Bakri SHA and Sudiajeng L, 2004).

To analyze the causes of accidents from work exhaustion factors in traffic accidents that occur on bus cars, especially the Intercity in Province (AKDP) buses, fatigue research is necessary to study work-fatigue using a light reaction timer method. The scope of this research is all AKDP bus drivers with route Padang – Bukittinggi – Payakumbuh. This scope is because the AKDP bus route permit from or to the city of Padang that is issued by the Ministry of Transportation has the highest number of

destinations from or to Bukittinggi and Payakumbuh (Government of West Sumatera Province. Governor Regulation of West Sumatra No. 36/2012).

II. METHODS

The measurement of work-fatigue based on reaction time by using a reaction timer light response to 60 respondents aged 25-40 years, with the weight of 58 - 60 kg. All respondents have some driving shift three times. Reaction timer is a tool that is used to measure the speed of reactions given by worker to stimuli given. The form of stimulation given is in the way of light stimulation. The measurement is carried out before and after the work schedule ends with 20 repetitions, where ten measurement results in the middle used as the data (Kosinski, 2014). This activity is carried out for two consecutive working days.

The results of these measurements obtained data in the form of reaction time, where the higher the value of reaction time means that there is a slowdown in the physiological and muscle processes. The reaction time depends on the stimuli that were made, the intensity of the duration of the stimulus and the age of the object of research. Fatigue standards based on reaction time ((Tarwaka, Bakri SHA and Sudiajeng L, 2004) can be seen in Table 1.

Table 1. Work-Fatigue Level

Level	Reaction time (milliseconds)
Normal	150 – 240
Light	>240 – <410
Medium	>410 – <580
Heavy	>580

Data processing was done by correlation and regression statistical analysis. The analysis was used to observe the relationship and the effect of working hours (number of shifts) on driver fatigue refers to changes in reaction time, before departure with after the departure of each shift.

III. RESULTS

Driver's fatigue was observed using the reaction time seen on trips 1, 2 and 3 before and after. Where is the result of trip 1,2 and 3 reacttion time which is observed in Figure 1.

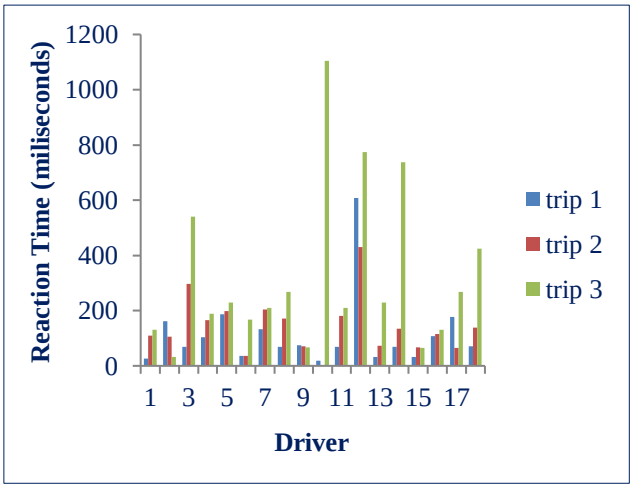

Figure 1. Driver Fatigue Level Trip 1 to Trip 3

The fatigue level of the Padang-Payakumbuh trip 1 minibus driver before leaving experienced a mild level of fatigue. The level of fatigue after driving has increased, namely the level of moderate fatigue. The fatigue level of the drivers of the Padang-Payakumbuh minibus trip 2 drivers before leaving experienced a moderate level of fatigue, while after driving the fatigue level increased to a severe fatigue level. Trip 3 drivers before leaving experience the level of severe fatigue and after driving the level of driver fatigue is increasing.

IV. DISCUSSIONS

The character of respondents aged between 25-40 years, with body weight. The results of the measurement of reaction time before and after the last shift (before going home) can be seen in Table 2 below. One shift, it means that drivers do one rotation from Padang – Bukittinggi - Payakumbuh – Bukittinggi – Padang.

Table 2. The measurement of reaction time

Fatigue level	Shift I (%)	Shift II (%)	Shift III (%)	After Work (%)
Normal	88.89	0.00	0.00	0.00
Light	11.11	55.56	50.00	27.78
Medium	0.00	38.89	38.89	33.33
Heavy	0.00	5.56	11.11	38.89

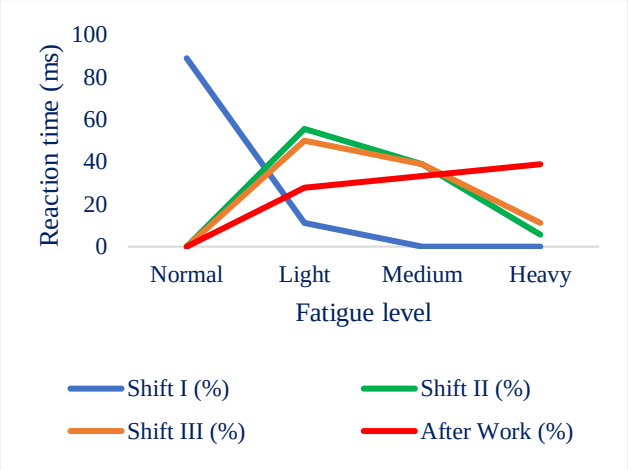

Figure 2. The measurement of reaction time

Figure 2 can be seen, 11.11% of respondents have experienced light level of fatigue before starting work (first shift). This condition is due to a lack of rest. After an unstructured interview, some respondents did admit that they often had to stay together even though they had entered at the time of rest after work. Next, in table 2 can also be analyzed, along with the implementation of the number of shifts, the level of fatigue of the AKDP bus driver will also increase. The percentage of drivers who run into medium and heavy level of fatigue 38.89% and 11.11%. The range of implementation between shifts, the driver gets a rest period of 30-45 minutes before restarting his work.

Based on statistical analysis of correlation and regression, coefficient r = 0.91 which indicates a strong positive relationship. Therefore the coefficient of determination (R2) 81% fatigue bus driver AKDP Route Padang - Bukittinggi - Payakumbuh was influenced by the working shift. Fatigue experienced by AKDP bus drivers causes related to lifestyle: lack of sleep, lack of exercise, nutrition, endurance, circadian rhythm. Also, causes related to the workplace: shift work, bus temperature, irradiation, noise, work monotony, and boredom, workload. AKDP bus owners need active involvement in giving the drivers time off before starting the next shift. Besides, it is also necessary to take into account the obligation of the owner of the AKDP bus company to guarantee the intake of nutrients by the workload of the driver instead of providing food money.

V. CONCLUSION

Increasing the number of shifts would increase the fatigue of the AKDP BUS driver. 33.33% and 38.89% of drivers run into medium and heavy level of fatigue based on reaction time after work. The work-fatigue increases the driver's trip. The relationship between work-fatigue and the driver's shift has a reliable and positive correlation and significant influence (r = 0.91).

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