

The Relationship Between Mental Workload and Sleep Quantity with Work Fatigue among Haul Dump Truck Operators in Coal Mining

Asti Puspita Nurahma¹, Indriati Paskarini², Endang Dwiyantri³, Sahabat Sutanto⁴

¹ Master of Occupational Health and Safety, Faculty of Public Health, Universitas Airlangga, Indonesia

^{2,3}Department of Occupational Safety and Health, Faculty of Public Health, universitas Airlangga, Indonesia

^{1,2,3}Campus C Mulyorejo, Surabaya, East Java 60115, Indonesia

⁴The Center for Development of Occupational Safety and Health, Indonesia

Jl. Dukuh Menanggal No.122, Dukuh Menanggal, Gayungan, Surabaya, East Java 60234, Indonesia

ABSTRACT

Introduction: In mining production activities, haul dump trucks are utilized for transportation purposes and are driven by an operator. The haul dump truck operator works in a shift work system consisting of 12 working hours. The workers are required to always control the steering speed, causing potential work fatigue. This study aimed to analyze the relationship between mental workload and sleep quantity with work fatigue among haul dump truck operators. **Method:** This study was a quantitative research study using a cross-sectional design. The population was 179 haul dump trucks operators, while the sample was 123 respondents determined through simple random sampling. The variables of this study were age, years of service, education level, mental workload, sleep quantity, and work fatigue complaints. The data was tested using the Chi-Square test. The instruments used to obtain the data were the National Aeronautics and Space Administration Task Load Index and the Work Fatigue Measurement Tool Questionnaire. **Result:** The haul dump truck operators (54.5%) had a high mental workload, low sleep quantity (61.8%) with less than 7 hours of sleep, and moderate fatigue complaints (44.7%). There was a significant relationship found between age (P-value = 0.018), years of service (P-value = 0.039), and sleep quantity (P-value = 0.001) with work fatigue complaints. The level of education and mental workload had a significance value above 0.05. **Conclusion:** Sleep quantity has a significant relationship with work fatigue complaints. This can be responded to by intensifying the information on the socialization of fatigue and the importance of maintaining the quality of sleep.

Keywords: mental workload, sleep quantity, work fatigue

Corresponding Author:

Indriati Paskarini

Email: indriati.paskarini@fkm.unair.ac.id

Telephone: +6281234556464

INTRODUCTION

The development of increasingly advanced technology has pushed Indonesia to reach the stage of industrialization. Indonesia is one of the developing countries that continues to improve its progress in various sectors, one of which is the mining sector. The increase in coal production for both domestic and export needs is expected to support the mining sector.

Coal mining consists of all activities such as searching for raw materials, extracting coal, managing the natural resources, human resources, production facilities, tools and machines, as well as processing and marketing coal. Mining is one of

the main sectors that contributes significantly to the economic growth in Indonesia, therefore the work in mining areas is carried out continuously over 24 hours without stopping (Suryaningsi, 2017). One of the heavy equipment units used in coal mining is a haul dump truck driven by an operator who already has an Operational License and Permit. The company prefers workers who are experienced and who have a certificate of training in their field. It is also possible for new workers or fresh graduates to achieve this. The Covid-19 pandemic has affected the current coal production which in turn has impacted the national mining industry. Changes in the work patterns that occur in the mining industry are a problem for the workforce, therefore the implementation of occupational safety and health has become a priority, especially regarding work fatigue complaints.

Generally, fatigue is described as the condition of feeling tired or sleepy due to a prolonged physical

Cite this as: Nurahma, A. P. *et al.* (2022) 'The Relationship Between Mental Workload and Sleep Quantity with Work Fatigue among Haul Dump Truck Operators in Coal Mining', *The Indonesian Journal of Occupational Safety and Health*, 11(3), pp. 333-342.

and mental workload and ongoing anxiety, thereby increasing the workload from the work environment due to a lack of rest or sleep (Yazdi and Haghghi, 2015). In addition, the factor of sleep deprivation has a negative impact on health, concentration, emotions, and behavior. Sleep is a priority as part of being healthy, so a lack of sleep is not a good thing (Samodra *et al.*, 2021). Based on Friedman's research (2019), accidents and deaths are caused by workers who work for long periods of time or who exceed 47 hours a week. Fatigue reduces the level of alertness leading to errors and an increase in accidents and injuries, especially when operating material transportation equipment.

Operating the unit in an unhealthy physical and mental condition and with an inappropriate amount of sleep has negative impacts, one of which is work fatigue. This can cause difficulty concentrating at work, an increased risk of labor errors, an impact on work quality, and work accidents because the occupational health and safety requirements have not been met properly (Kristiawan, 2018). If the productivity level of a worker is disturbed due to physical and psychological fatigue, the consequences will be experienced by the company in the form of a decrease in company productivity (Budiono, Jusuf, and Pusparini, 2016). The losses suffered will not only be in the form of material losses but more than that, the number of fatalities will not be small.

The coal mining company is a mining contractor located in South Kalimantan Province. The company has developed its business in connection to mining services, meaning that it is trusted to exploit mining commodities in various places in Indonesia. In its production activities, the company uses a 40 bank cubic meter (bcm) haul dump truck unit. The mining operators have the potential to experience work fatigue because production activities are carried out 24 hours a day and this time is only divided into two work shifts. The mining roads used for coal transportation and overburdened excavation contributes 15% to mining accidents from among 14 other locations such as processing areas, stockpiling, ports, workshops, warehouses, mess areas, canteens, and others (Suparno *et al.*, 2020). Therefore, the mental workload and sleep quantity factors that cause work fatigue among haul dump truck operators need to be investigated to support the company's development of better occupational safety and health.

METHODS

The researcher applied the quantitative research method using a cross-sectional approach and observational techniques. This study was conducted at a coal mining company in South Kalimantan Province, in June 2021. The respondents in this study consisted of 123 workers chosen using simple random sampling. The instruments used were standardized questionnaires, namely the Work Fatigue Measuring Tool Questionnaire (KAUPK2) and the National Aeronautics and Space Administration Task Load Index (NASA-TLX). This research also conducted observations to corroborate the results of the study. The variables were divided into two parts, namely the dependent variable (work fatigue) and the independent variables (age, years of service, education level, sleep quantity, and mental workload). The data analysis used was univariate and bivariate. The statistical analysis of the data was performed using the Chi-Square test. This research ethics obtained a certificate with an ethics code from the Health Research Ethics Committee, Airlangga University number 242/HRECC.FODM/V/2021.

RESULTS

This study was conducted among OHT unit haul dump truck operators in a coal mining company.

Table 1. Frequency Distribution of Haul Dump Truck Operators by Age, Years of Service, and Education Level in June 2021 in Coal Mining

Variables	Frequency (n)	Percentage (%)
Age		
< 25 years	17	13.8
26-35 years	60	48.8
36-45 years	43	35
> 46 years	3	2.4
Years of Service		
< 1 year	34	27.6
1-2 years	69	56.1
> 3 years	20	16.3
Education Level		
Elementary School	0	0
Junior High School	2	1.6
Senior High School	120	97.6
Academic	1	0.8

Univariate analysis was conducted to find out the characteristics of the distribution of the respondents according to age, years of service, education level, mental workload, sleep quantity, and work fatigue complaints. The results of this study can be seen in Tables 1 - 3.

Table 1 shows that the majority of the respondents aged 26 - 35 years totaled 60 people (48.8%) from 4 age categories. Additionally, 69 respondents had 1-2 years of service (56.1%) from among 3 years of service categories. Finally, 120 respondents were senior high school graduates (97.6%) from among 4 education level categories.

Table 2 shows that most of the respondents have a high mental workload totaling 67 people (54.5%) from 3 mental workload categories. Sleep quantity <7 hours totaled 76 people (61.8%) from 2 sleep quantity categories.

Table 3 shows that 53 respondents had mild work fatigue (43.1%), 55 people felt moderate work fatigue (44.7%), and 15 people felt severe work fatigue (12.2%). Most of the respondents

Table 2. Frequency Distribution of the Haul Dump Truck Operators Based on Mental Workload and Sleep Quantity in June 2021 in Coal Mining

Variables	Frequency (n)	Percentage (%)
Mental Workload		
Low	0	0
Moderate	6	4.9
Little High	5	4.1
High	67	54.5
Very High	45	36.6
Sleep Quantity		
< 7 hours	76	61.8
≥ 7 hours	47	38.2
Total	123	100

Table 3. Frequency Distribution of Haul Dump Truck Operators Based on Work Fatigue Complaints in June 2021 in Coal Mining

Variables	Frequency (n)	Percentage (%)
Work Fatigue		
Mild Fatigue	53	43.1
Moderate Fatigue	55	44.7
Severe Fatigue	15	12.2
Total	123	100

experienced moderate fatigue from among 3 work fatigue categories.

Table 4 shows the results of the bivariate analysis in which there is a significant relationship between the variables of age (P-value = 0.018), years of service (P-value = 0.039), and sleep quantity (P-value = 0.001) with the work fatigue complaints of the haul dump truck operators. Meanwhile, there is no significant relationship between the education level (P-value = 0.827) and mental workload variables (P-value = 0.574) with the work fatigue complaints of haul dump truck operators. Mental workload has a correlation coefficient of -0.066. The most significant contributing factor to work fatigue complaints is sleep quantity as it has a correlation coefficient of 0.340.

DISCUSSION

The coal mining process starts with land clearing, stripping, excavation, and the removal of soil and waste rock, through to reclamation. Hauling is the process of transporting coal (coal hauling) or transporting overburden from the mining products from one place to another. The coal stockpile is put in the stockpile, while the overburden is disposed of. Coal and overburden (OB) are transported using a material conveyance commonly known as a haul dump truck.

Haul dump truck operators have quite unique health risks that can affect fatigue. The production process in mining is carried out in a sustainable manner and takes a long time, therefore that haul dump truck operators are required to maintain their activity alongside this. The condition of the workers not only depends on how long they have to rest. It also depends on their resting conditions, when they can rest, and how long they rest for. The schedule and facilities regarding the rest that the workers get has a huge influence on whether a worker can rest optimally.

Fatigue is one of the factors that can reduce the work capacity and bodily resistance of workers (Tenggor, Pondaag, and Hamel, 2019). There are two types of fatigue, namely muscle fatigue and general fatigue. Muscle fatigue is characterized, among others, by tremors and pain in the muscles. General fatigue is characterized by a loss of will to work, the cause of which is a state of central nervousness or a psychic-psychological condition.

The duration of the occurrence of fatigue consists of either acute fatigue or chronic fatigue

Table 4. Cross-Tabulation Between the Variables with Work Fatigue Complaints

Variables	Work Fatigue						Total		Sig.
	Mild Fatigue		Moderate Fatigue		Severe Fatigue		N	%	
	n	%	n	%	n	%			
Age									
≤ 25 years	2	11.8	11	64.7	4	23.5	17	100	0.018
26-35 years	32	53.3	23	38.3	5	8.3	60	100	
36-45 years	19	44.2	19	44.2	5	11.6	43	100	
> 46 years	0	0	2	66.7	1	33.3	3	100	
Years of Service									
< 1 year	19	55.9	13	38.2	2	5.9	34	100	0.039
1-2 years	30	43.5	32	46.4	7	8.4	69	100	
> 3 years	4	20	10	50	6	30	20	100	
Education Level									
Elementary School	0	0	0	0	0	0	0	0	0.827
Junior High School	1	50	1	50	0	0	2	100	
Senior High School	51	42.5	54	45	15	12.5	120	100	
Academic	1	100	0	0	0	0	1	100	
Mental Workload									
Low	0	0	0	0	0	0	0	0	0.574
Moderate	3	50	1	16.7	2	33.3	6	100	
Little High	2	40	3	60	0	0	5	100	
High	27	40.3	31	46.3	9	13.4	67	100	
Very High	21	46.7	20	44.4	4	8.9	45	100	
Sleep Quantity									
< 7 hours	23	30.3	40	52.6	13	17.1	76	100	0.001
≥ 7 hours	30	63.8	15	31.9	2	4.3	47	100	

(Wan *et al.*, 2017). Acute fatigue is caused by fatigue from a series of demanding tasks performed in a short period of time. Excessive mental workload and physical activity can cause acute fatigue. Chronic fatigue is caused by a condition known as continuous fatigue that lasts for 4 months that is not corrected and occurs throughout the day due to a series of tasks performed over a long period of time. Chronic fatigue sometimes occurs before doing work. Acute fatigue can be treated with rest or lifestyle changes.

Work fatigue describes the entire bodily response to the activities carried out and the exposure received during work. When the body performs activities over 8 hours of work, the body will be prone to fatigue (Juliana, Camelia, and Rahmiwati, 2018). A body that experiences fatigue

will show symptoms such as frequent yawning, thirst, drowsiness, and difficulty concentrating.

Fatigue should be seen as a continuum related to factors in the work environment as well as in everyday life. Fatigue at work is a consequence of modern industry (Caldwell *et al.*, 2019). The work fatigue experienced by haul dump truck operator is a normal condition. However, if it occurs throughout the day for a long time, it can have quite a big impact. Fatigue is very severe – it has almost the same effect as consuming large amounts of alcohol. Exhausted workers have a much greater risk of accidents as a result of the behavior of the workers themselves, compared to the workers who are in top condition. The fatigue experienced by the operators causes decreased concentration, sleep disturbances, emotional disturbances, and a decreased ability to

perform their daily activities (Djamiludin, Safriany, and Sari, 2021).

The work system applied in the company is a weekly work roster that is regulated by each department and adjusted according to the company operations. The working period applied is 12 working weeks and 2 weeks of periodic leave. The results of this study show that 12.2% of respondents experienced severe work fatigue complaints. This figure is lower compared to mild work fatigue and moderate work fatigue. This percentage can increase if the workload is not balanced with prevention and control processes. For a professional mining company, it is appropriate to provide facilities that not only support rest activities but also provide entertainment facilities as a means for their workers to get entertainment so then the mind does not so easily experience stress.

The Relationship Between Age, Years of Service, and Educational Level with Work Fatigue Complaints

The results of the bivariate analysis showed there to be a significant relationship between the age and work fatigue of haul dump truck operators. Age had a negative correlation coefficient with work fatigue, meaning that the lower the operator's age, the more work fatigue they had. The results of this study are in line with Hidayanti's (2021) study where the respondents aged 21 - 30 years old had a higher level of fatigue than the age group >30 years old. This was acceptable considering that this age was considered productive and had sufficient skill maturity. At this age, the operators must have a high level of responsibility to support good mining practices in the company. Young workers are considered to have not enough experience and they are still in the adaptation stage, meaning that they are more likely to experience conflict and be pressured by their work (Swasti, Ekowati, and Rahmawati, 2018). The pressure that is felt continuously has an unfavorable impact on the condition of the body, resulting in them feeling more fatigued.

Overall, the ability of the workers of productive age is almost the same. But on the other hand, young haul dump truck operators have problems managing their rest periods. When it is time to go home, some workers prefer to relax and hang out before going home. This can be detrimental to the workers and to the company given the current state of the Covid-19 pandemic. The direct implementation of Covid-19

prevention policies consists of the implementation of health protocol policies, namely maintaining a distance from others and avoiding crowds (Rizal, Afrianti, and Abdurahman, 2021). The same result is shown in Thamrin's research (2020) in that there is a relationship between age and work fatigue. In this study, there is a positive correlation coefficient because there are more workers in the elderly category. This is where the ability and physical endurance of the workers has begun to decline. The results of this study are not in line with those of Rahmawati and Tualeka's (2019) where fatigue increases with age. This can happen because as people get older, their organs and senses will experience degeneration, such as sight, hearing, and reaction time. The aging process is a challenge that must be overcome because it is defined as a process of decreasing work performance and decreasing physical capacity (Kurnianto, 2015). As a result, they become less productive and susceptible to disease.

Years of service refers to the period of time or the length of time that the workers have worked in a place for (Suma'mur, 2014). The bivariate analysis results show that there was found to be a significant relationship between years of service and work fatigue complaints. The working period had a positive correlation coefficient with work fatigue, meaning that the longer the operator's working period, the more work fatigue they experienced. The results of this study are in line with Setiawan's (2020) study where there was a relationship between years of service and the work fatigue of dump truck drivers. Workers who have a working period of > 3 years are considered to understand the field conditions or the work environment and further understand the unit to be operated, therefore it will be easier for them to work.

The years of service of the dominant operator had not been for long because the new mining job site had been inaugurated about two years ago. Many experienced new employees were recruited and; the rest were transferred from different job sites. Workers who have a longer working period have the advantage of detecting and finding the causes of errors at work, meaning that they can detect errors in the production process (Nurdiawati and Safira, 2020). Haul dump truck operators who have a service life of < 1 year need to adapt to new types of haul dump trucks. There needs to be the introduction of new units and components so then the operators

can adjust their posture. If the operator is skilled in operating the haul dump truck unit and it is not improved, then the possibility of fatigue may occur due to ergonomic factors. Someone who is new to work and finds it very physically and mentally tiring means that the occurrence of work fatigue is likely to be very large (Malik, Hardi, and Abbas, 2021). Boredom and saturation were the other factors that were found to cause work fatigue because they were given the same task continuously.

The bivariate analysis results showed that there was no significant relationship between education level and work fatigue complaints. The results of this study are in line with Elwindra's (2019) study that there was no significant relationship between educational background and driver fatigue. The higher a person's education, the wider their ways of thinking and higher reasoning power, which can affect work fatigue (Suwaryo and Yuwono, 2017).

Working as a haul dump truck operator, apart from requiring good soft skills, also does not rule out having academic skills that must be good as well. Every worker is required to follow the established rules, namely in terms of the use of complete personal protective equipment. Every new worker, visitor, or guest from outside the mine, and workers who have finished their leave, must follow the induction given by the company. The induction contains information regarding the explanations of and directions on occupational safety and health related to potential hazards, hazard control, rescue methods in relation to the general mining activities, and a statement understanding the regulations. Violations of the disciplinary rules will greatly affect the safety and health culture formed in the company.

Education plays an important role in improving the quality of the human resources in the midst of increasingly fierce global competition. Learning experiences can shape a person's mindset which will be used in the future in the world of work, including managing work accident prevention and improving the health status of workers. Someone who is older, more educated, and physically active generally does not feel as fatigued (Engberg *et al.*, 2017).

The Relationship Between Mental Workload and Work Fatigue Complaints

The bivariate analysis results showed that there was no significant relationship between mental workload and work fatigue complaints. The results of this study are in line with Minarna's (2018) study

where there was found to be no relationship between mental workload and the work fatigue complaints of haul dump truck drivers. In general, haul dump truck operators have a relatively high level of mental workload and this needs improvement. Mental workload has no visible immediate impact. Workers may be barely aware that their workload is excessive. The dimension that contributed the most to the average Weighted Workload (WWL) was the performance dimension. Performance was determined by how successful they were at achieving their work targets and how satisfying their performance was when achieving those targets. In one shift for 12 working hours, an operator must work maximum and optimally to achieve said targets.

Tarwaka (2019) stated that workload is influenced by internal and external factors. Internal factors that affected the mental workload were haul dump truck operators doing their work fairly heavily. Operators with few years of service needed to adapt to a 12-hour working pattern. One of the reasons for the increase in mental workload was the weather. If the weather is sunny, the operator must work optimally. The job as a haul dump truck operator tends to be boring because they have to sit driving the unit for more than 9 hours. On the other hand, if the weather is rainy, the operator will not carry out material transportation activities.

In one shift, the operator must meet the production target of + 42 rits per unit. These activities require the operators to continue to concentrate coupled with physical activity such as daily examination and checks (P2H) and climbing up and down units, which is quite tiring. External factors include the factors outside the individual such as the feasibility of the unit used, changes in work patterns such as a longer roster, and work environment problems. The Covid-19 pandemic has changed the work order, and the roster has become longer. However, this is only temporary during the Covid-19 pandemic.

Working in a mining company is everyone's dream because it is considered to be prestigious. Having a high salary, access to facilities, and benefits are the reasons why people want to work in mining. This is proportional to the perceived weight of the workload. Workers must be prepared to deal with high risks such as being in remote locations deep in the forest, working away from their family, at times experiencing communication difficulties due to lack of signal, through to the existence of an

unsupportive image of the work environment and mine security. Workers must have a strong mentality, a strong personality, and social support from the people closest to them because this greatly affects their daily performance. Not infrequently does this cause complaints of fatigue among the workers. Especially those who occupy positions in the field such as haul dump truck operators.

The work process as a haul dump truck operator requires physical readiness and a high level of work accuracy. Although it looks like a light activity because it is 'just' sitting driving the unit, in reality the work involves a fairly heavy workload because the work consists of unnatural work processes such as monotonous work, extreme work environments, work station designs that are not ergonomic, and a market demand continues to increase every year.

Mental workload often causes shortness of breath as the oxygen intake to the brain is reduced. A lack of oxygen intake causes the body to respond in terms of the heartbeat and central nervous system, causing symptoms of stress (Zetli, 2019). A high mental workload can cause the stimulation of the central nervous system which can cause pain and work-related illness. If the mental workload exceeds the body's ability, it will cause discomfort, fatigue, and decreased productivity.

Overloading and underloading are important concerns that can have an impact on fatigue (Cham *et al.*, 2021). The excessive mental workload is a result of the many demands of the work and high time pressure, which can have implications regarding the welfare of the workers. The results of this study are in line with Innah's (2021) study where there was found to be no relationship between workload and fatigue. Each workload must be in accordance with the physical abilities, cognitive abilities, and limitations of the humans who receive the workload. The heavier the workload, the faster the worker will experience fatigue.

The Relationship Between Sleep Quantity and Work Fatigue Complaints

The bivariate analysis results showed that there was a significant relationship between sleep quantity and work fatigue. Sleep quantity has a positive coefficient correlation with work fatigue, meaning that the less the operator sleeps, the more their work fatigue increases. The results of this study are in line with Narpati, Ekawati and Wahyuni's (2019) study where there was found to be a significant relationship

between sleep duration and the symptoms of work fatigue.

Sleep is an unconscious state where there is a decrease in individual perception and reactions to the environment but they can still be awakened through the provision of sufficient stimulation (Arifin and Wati, 2020). In a state of sleep, the body carries out the rehabilitative processes that will restore the body's stamina to an optimal condition. Everyone needs adequate sleep so then the body can function normally. There are 2 factors related to a person's sleep needs being sufficient, namely the quality of sleep and the quantity of sleep. Sleep quality is how often a person wakes up while sleeping at night. Sleep quantity is how long a person sleeps for.

The condition of sleep deprivation is widely felt among young adults (Caesarridha, 2021). Lack of sleep has many bad effects in everyday life. The main aspect that is greatly influenced by a person's lack of sleep is a decrease in their memory and concentration aspects. This is in line with the theory that when humans lack sleep, there is a condition called sleep debt that can be rebalanced only through sleep (Sastrawan and Griadhi, 2017). This is regulated by the sleep homeostat which works to regulate sleep desires. If the amount of sleep debt is large, the sleep homeostat will give a signal or sign that we need to sleep more. People who are sleep deprived will feel excessive sleepiness and decreased concentration, and have slower motor reflexes.

Shift changes in workers affects their sleep time. Operators who work at night experience changes in their sleep patterns which results in a lack of sleep needs being met, resulting in excessive sleepiness during the day. Working at night can complicate a person's lifestyle and it can be associated with the risk of sleep deprivation (Pepin *et al.*, 2018). Based on the results of this study, it is known that many haul dump truck operators have a sleep quantity of less than 7 hours while the majority of operators made complaints of work fatigue in the moderate category. This is because the operators are good at managing their rest time.

Long working hours mean that the operators have little rest time. What's more, coupled with a long travel time, the rest time at their home is often shorter. In addition, the living environment is one of the factors that affects the quantity of a person's sleep. If the atmosphere of their place of residence is not comfortable, if the conditions are not clean

and so on, it is possible for a person's sleep to be disturbed or unhealthy.

Every day before starting work, operators are required to fill out a safety briefing form and a statement of readiness to work. The sheet includes questions on the time they went to sleep, the time they woke up, and the total hours of sleep that they got. If the workers had little sleep, the head department or foreman will give them a warnings and advice. If an accident occurs due to fatigue, the operator must be ready to take responsibility for all risks in accordance with the applicable regulations.

According to Fenny and Supriatmo's (2016), the majority of individuals need between 7 to 8 hours of sleep every day for the individual to be fully awake. Operators who lack sleep can make their bodies weak and they will feel sleepy when working. Older workers usually experience more sleep deprivation due to difficulty initiating sleep due to their age (Härmä *et al.*, 2019). In addition to the quantity of sleep, each person has a different quality of sleep. Operators who work during the day have a better quality of sleep than those who work at night.

CONCLUSION

Based on the results of this study regarding the relationship between mental workload and sleep quantity with work fatigue complaints, it can be concluded that there is a significant relationship between sleep quantity and work fatigue complaints. The sleep quantity of the haul dump truck operator has a positive correlation coefficient which indicates the lower the quantity of sleep, the more the level of work fatigue increases.

Prevention and control can be implemented by intensifying the socialization of fatigue regarding the importance of maintaining a certain quantity and quality of sleep. In addition, reducing the working hours and work shifts to 3 shifts over a 24-hour period is better for the welfare of haul dump truck operators.

ACKNOWLEDGMENTS

The authors express their gratitude to Allah SWT. The authors would like to thank all of those who contributed to the writing of this study. The

authors would like to acknowledge the coal mining company in South Kalimantan, Indonesia.

REFERENCE

- Arifin, Z. and Wati, E. (2020) 'Hubungan Kualitas Tidur Dengan Konsentrasi Belajar Pada Mahasiswa Keperawatan Universitas Muhammadiyah Purwokerto', *Human Care Journal*, 5(3), pp. 650-660.
- Budiono, A. M. S., Jusuf, R. M. S. and Pusparini, A. (2016) *Bunga Rampai Hiperkes & KK : Higiene Perusahaan, Ergonomi, Kesehatan Kerja, Keselamatan Kerja*. Revisi. Semarang: Badan Penerbit Universitas Diponegoro Semarang.
- Caesarridha, D. K. (2021) 'Hubungan Kualitas Tidur Dengan Konsentrasi Belajar Pada Mahasiswa Fakultas Kedokteran Di Masa Pandemi Covid-19', *Jurnal Medika Utama*, 2(4), pp. 1213-1217.
- Caldwell, J. A. *et al.* (2019) 'Fatigue and its Management in the Workplace', *Neuroscience and Biobehavioral Reviews*, 96(2019), pp. 272-289.
- Cham, B. S. *et al.* (2021) 'Investigating the Joint Effects of Overload and Underload on Chronic Fatigue and Wellbeing', *International Journal of Work, Health, and Organisations*, 35(3), pp. 1-14.
- Djamaludin, D., Safriany, R. and Sari, R. Y. (2021) 'Pengaruh Breathing Exercise Terhadap Level Fatigue Pasien Hemodialisis', *Malahayati Nursing Journal*, 3(1), pp. 72-81.
- Elwindra, E. and Rizal, M. (2019) 'Faktor-Faktor yang Berhubungan dengan Kelelahan Kerja pada Pengendara Ojek Online di Jakarta Timur Tahun 2018', *Jurnal Persada Husada Indonesia*, 6(21), pp. 1-8.
- Engberg, I. *et al.* (2017) 'Fatigue in the General Population- Associations to Age, Sex, Socioeconomic Status, Physical Activity, Sitting Time and Self-Rated Health: the Northern Sweden MONICA Study 2014', *BMC Public Health*, 17(1), pp. 1-9.
- Fenny, F. and Supriatmo, S. (2016) 'Hubungan Kualitas dan Kuantitas Tidur dengan Prestasi Belajar pada Mahasiswa Fakultas Kedokteran', *Jurnal Pendidikan Kedokteran Indonesia: The*

- Indonesian Journal of Medical Education*, 5(3), pp. 140-147.
- Friedman, L. S., Almberg, K. S. and Cohen, R. A. (2019) 'Injuries Associated with Long Working Hours among Employees in the US Mining Industry: Risk Factors and Adverse Outcomes', *Occupational and Environmental Medicine*, 76(6), pp. 389-395.
- Härmä, M. et al. (2019) 'Shift Work with and Without Night Work as a Risk Factor for Fatigue and Changes in Sleep Length: A Cohort Study with Linkage to Records on Daily Working Hours', *Journal of Sleep Research*, 28(3), pp. 1-9.
- Hidayanti, R. C. and Sumaryono, S. (2021) 'The Role of Sleep Quality as Mediator of Relationship between Workload and Work Fatigue in Mining Workers', *Jurnal Psikologi*, 48(1), p. 62.
- Innah, M. et al. (2021) 'Faktor Yang Berhubungan Dengan Kelelahan Kerja Pada Penjahit Pasar Sentral Bulukumba', *Window of Public Health Journal*, 1(5), pp. 471-481.
- Juliana, M., Camelia, A. and Rahmiwati, A. (2018) 'Analisis Faktor Risiko Kelelahan Kerja pada Karyawan Bagian Produksi PT. Arwana Anugrah Keramik, Tbk', *Jurnal Ilmu Kesehatan Masyarakat*, 9(1), pp. 53-63.
- Kristiawan, R. (2018) 'Faktor Penyebab terjadinya Kecelakaan Kerja pada Area Penambangan Batu Kapur Unit Alat Berat PT. Semen Padang.', *Jurnal Bina Tambang*, 5(2), pp. 11-21.
- Kurnianto, D. (2015) 'Menjaga Kesehatan Di Usia Lanjut', *Jurnal Olahraga Prestasi*, 11(2), p. 115182.
- Malik, I., Hardi, I. and Abbas, H. H. (2021) 'Faktor yang Berhubungan dengan Kelelahan Kerja di PT. Industri Kapal Indonesia (Persero) Makassar', *Window of Public Health Journal*, 1(5), pp. 580-589.
- Minarna, F. M. (2018) 'Hubungan Antara Faktor Individu Dan Beban Kerja Mental Dengan Keluhan Kelelahan Kerja Pada Pengemudi Haul Dumptruck', *Journal of Community Mental Health and Public Policy*, 1(1), pp. 1-12.
- Narpati, J. R., Ekawati and Wahyuni, I. (2019) 'Hubungan Beban Kerja Fisik, Frekuensi Olahraga, Lama Tidur, Waktu Istirahat Dan Waktu Kerja Dengan Kelelahan Kerja (Studi Kasus Pada Pekerja Laundry Bagian Produksi Di CV. X Tembalang, Semarang)', *Jurnal Kesehatan Masyarakat*, 7(1), pp. 337-344.
- Nurdiawati, E. and Safira, R. A. D. (2020) 'Hubungan antara Keluhan Kelelahan Subjektif, Umur dan Masa Kerja terhadap Produktivitas Kerja pada Pekerja', *Faletehan Health Journal*, 7(2), pp. 113-118.
- Pepin, E. et al. (2018) 'Shift Work, Night Work and Sleep Disorders among Pastry Cookers and Shopkeepers in France: A Cross-sectional Survey', *BMJ Open*, 8(5), pp. 1-12.
- Rahmawati, N. D. and Tualeka, A. R. (2019) 'Correlation between Individual Characteristics, Workload, and Noise with Work Fatigue', *The Indonesian Journal of Occupational Safety and Health*, 8(2), pp. 139-149.
- Rizal, M., Afrianti, R. and Abdurahman, I. (2021) 'Dampak Kebijakan Pemberlakuan Pembatasan Kegiatan Masyarakat (PPKM) bagi Pelaku Bisnis Coffe shop pada Masa Pandemi Terdampak Covid-19 di Kabupaten Purwakarta The Impact of the Policy for Implementing Community Activity Restrictions for Coffee Shop Busi', *Jurnal Inspirasi*, 12(1), pp. 97-105.
- Samodra, Y. T. J. et al. (2021) 'Alokasi Waktu Tidur dan Upaya Bugar Sehat di Masa Puasa', *Tadulako Journal Sport Sciences And Physical Education*, 9(1), pp. 19-29.
- Sastrawan, I. M. A. and Griadhi, I. P. A. (2017) 'Konsentrasi Mahasiswa Program Studi Fakultas Kedokteran Universitas Udayana', *E-Jurnal Medika*, 6(8), pp. 1-8.
- Setiawan, B., Fauzan, A. and Norfai. (2020) 'Tingkat Kelelahan Kerja Pada Driver Dump Truck Ditinjau Dari Aspek Masa Kerja Dan Usia Di Pt Hasnur Riung Sinergi Site PT Bhumi Rantau Energi Tahun 2019', *Medical Technology and Public Health Journal*, 4(2), pp. 134-145.
- Suma'mur. (2014) *Higiene perusahaan dan kesehatan kerja (Hiperkes)*. Cet. 1. Jakarta: Sagung Seto.
- Suparno, F. A. D., et al. (2020) 'Manajemen Risiko Kecelakaan Kerja Akibat Blindspot pada Disposal Area Menggunakan Analisis HIRARC', *Jeneral: Jurnal Teknologi Sumberdaya Mineral*, 1(1), pp. 31-42.
- Suryaningsi, T. (2017) 'Perempuan Pekerja Tambang di Antara Dua Dunia', *Etnosia: Jurnal Etnografi Indonesia*, 2(1), pp. 134-152.

- Suwaryo, P. A. W. and Yuwono, P. (2017) 'Faktor-Faktor yang Mempengaruhi Tingkat Pengetahuan Masyarakat dalam Mitigasi Bencana Alam Tanah Longsor', *Urecol 6th*, 20(1), pp. 305–314.
- Swasti, K. G., Ekowati, W. and Rahmawati, E. (2018) 'Faktor-Faktor yang Mempengaruhi Burnout pada Wanita Bekerja di Kabupaten Banyumas', *Jurnal Keperawatan Soedirman*, 12(3), p. 190.
- Tarwaka. (2019) *Ergonomi Industri: Dasar-dasar Pengetahuan Ergonomi dan Aplikasi di Tempat Kerja*. II. Surakarta: Harapan Press.
- Tenggor, D., Pondaag, L. and Hamel, R. S. (2019) 'Faktor-Faktor Yang Berhubungan Dengan Kelelahan Kerja Pada Perawat Di Ruang Rawat Inap Rumah Sakit Umum Gmim Pancaran Kasih Manado', *Jurnal Keperawatan*, 7(1), pp. 1–8.
- Thamrin, Y. (2020) 'Kelelahan Kerja pada Pekerja Rumput Laut di Kabupaten Takalar', *Media Kesehatan Masyarakat Indonesia*, 16(1), pp. 15–25.
- Wan, J. J. *et al.* (2017) 'Muscle fatigue: General understanding and treatment', *Experimental and Molecular Medicine. Nature Publishing Group*, 49(10), pp. e384-11.
- Yazdi, Z. and Haghighi, K. Sadeghniaat. (2015) 'Fatigue Management in the Workplace', *Industrial Psychiatry Journal*, 24(1), pp. 12-17.
- Zetli, S. (2019) 'Hubungan Beban Kerja Mental Dan Stres Kerja Pada Tenaga Kependidikan Di Kota Batam', *Jurnal Rekayasa Sistem Industri*, 4(2), pp. 63-70.