MULTIDISCIPLINARY SCIENCE JOURNAL

RESEARCH ARTICLE
Published Online: October 10, 2023
https://doi.org/10.31893/multiscience.2024051

The modeling factors work shifts, fatigue and unsafe actions on work accidents at PT PLN Barru, Indonesia

Mega Putri Mattola[a] | Masyitha Muis[a] | Atjo Wahyu[a] | Furqaan Naiem[a] | Yahya Thamrin[a] | Hasanuddin Ishak[c]

[a]Department of Master of Occupational Health and Safety, Faculty of Public Health, Universitas Hasanuddin, Indonesia.

Abstract The number of work accidents is still very high in several countries, especially in developing countries. The lack of research examining risk factor models for work accidents is still in the spotlight. So that it requires modeling Factors of Work Shifts, Fatigue and Unsafe Actions on Work Accidents at PT PLN Barru, Indonesia. This research is an analytic observational study using a cross-sectional research design. The samples taken were 65 technical workers who were determined using the total sampling method. The collected data were analyzed using the chi-square test for bivariate and path analysis for multivariate. The findings show that there is an effect of work shift, and work fatigue on Unsafe Action. It was also found that work accidents were strongly influenced by work fatigue and unsafe actions with each P value <0.05. Meanwhile, there was no effect of work shifts on work accidents with a p value> 0.05. The findings also show that together the work shift combined with unsafe action will affect work accidents and work fatigue combined with unsafe action will also affect work accidents with each p value < 0.05. The magnitude of the influence can be seen by the magnitude of the T value, the greater the T value, the greater the influence that occurs. From the model obtained, it is known that unsafe action is a supporting factor in the occurrence of work accidents. The main factor that causes work accidents is work fatigue.

Keywords: modeling, work shift, fatigue, unsafe action, work accidents

1. Introduction

Today, people face many risks and difficulties when trying to earn money. This is increasing due to the high risk of occupational diseases and work accidents that occur in the work environment (Reason, 2016; Harrell, 1990). "A work accident is an incident at work that results in injury due to both physical and mental work" (Ilo, 2015). Occupational diseases are also very closely related to work accidents (Stanaway et al., 2018). Globally, work accidents have contributed to many incidents of disability (Abubakar et al., 2015; Gyedu et al., 2015; Global Road Safety Facility & IHME, 2014). Consistently, estimates show that more than 350,000 people worldwide suffer from it from accidents at work (Hämäläinen et al., 2006; Takala et al., 2014). Information related to the number of work accidents is very important for making regulations and policies to protect workers from hazards related to their work (Laurie, 1998).

Many factors can cause work accidents. Major accidents that have occurred, such as Long Ford and Piper Alpha, show that factors that affect work accidents can be human, technical, operational and organizational (Sklet, 2004; Sklet, 2006). Based on reports related to work accidents in Europe, work accidents are more influenced by organizational factors (53%) and human factors (11%) (Nivolianitou et al., 2006).

There is a relationship between organizational factors and employee behavior at work (Neal et al., 2000; Seo, 2005; Oliver et al., 2002; Cooper & Phillips, 2004). The relationship between organizational factors and safety performance was studied in Taiwanese and Japanese oil refinery workers. The results show that different organizational factors from the two countries are equally effective on employee safety performance (Hsu et al., 2008). The influence of organizational factors on safety efficacy, safety awareness, and safety behavior was studied in Jordanian companies and showed that management commitment significantly affects safety efficacy (Al-Refaie, 2013).

Director General of the Department of Occupational Health and Safety (OHS) from Indonesia Ministry of Manpower, said the number of work accidents from year to year continues to increase. Muji stated that the total amount work accidents have increased quite significantly, around 5-10% per year. According to data recorded on Social Health Insurance Administration Body (BPJS) work accident rate in 2022 increased quite significantly namely 265,334 cases.

 Received: August 02, 2023 | Accepted: September 20, 2023

Several demographic, lifestyle, and workplace factors have been reported to be associated with the risk of work accidents. These include age (Laflamme et al., 1996), alcohol consumption and smoking (Chipman, 1995; Frone, 1998; Wells & MacDonald, 1999; Oze et al., 2012), shift work (Behn & Gregorio, 2020; Bhadke & Rehman, 2022), and indirect factors—that is, factors that describe the situational circumstances in which the accident occurred (Wong et al., 2011; Dyreborg et al., 2022)

This research focuses on determining the relationship between work fatigue, unsafe actions, and work accidents that occurred at PT PLN Baru by using the path analysis modeling using SmartPLs 4 model. The novelty of this research is the formation of a model that connects the main and intermediary factors that cause work accidents. This study aims to obtain ideas and models of the relationship between factors in the occurrence of work accidents. It is hoped that this research will further clarify the causes and effects of workplace accidents that take many lives and cause disability in workers.

The Null Hypothesis (H0) including: (i) unsafe action is not a mediation between work shifts and work accidents in engineering workers at PT PLN (Persero) ULP Barru (ii) unsafe action is not a mediation between work fatigue and work fatigue work accidents in engineering workers at PT. PLN (Persero) ULP Barru. Meanwhile alternative hypotheses including: (i) unsafe action as mediation between work shifts and work accidents in engineering workers at PT. PLN (Persero) ULP Barru, (ii) unsafe action as mediation between work fatigue and work accidents in engineering workers at PT. PLN (Persero) ULP Barru.

2. Materials and Methods

This research is a quantitative study using an analytic observational design and a cross-sectional study approach. The independent variable of this research is work fatigue, the dependent variable is work accidents, and the intervening variable is unsafe action at the PT. PLN (Persero) ULP Barru. The research was conducted within 2 months from January to February 2023. The sample in this study used all technical workers, namely, 65 people. Observation and data collection were carried out by interviewing technical workers using a questionnaire and measuring using a blood sugar test kit (glucometer). The instruments used in this research were questionnaires, field notes and documentation.

This study used a path analysis model by (i) Univariate Analysis: describing each independent variable (age, BMI, job changes and length of service) and the dependent variable (work accident) using frequency distribution and percentage description; (ii) Bivariate Analysis: explaining the relationship between work shifts and work fatigue with work injuries to staff technical PT. PLN (Persero) ULP Barru uses the chi square test; (iii) Multivariate Analysis: knowing the relationship between these two variables and to control other variables as well as to find out the influence of these variables using the application or Smart PLS software.

3. Results and Discussion

The findings show that after conducting a modeling test using the smart PLS4 application, the results show that in a single line, work shifts do not affect work accidents, work fatigue affects work accidents, work shifts affect unsafe actions, work fatigue affects unsafe actions, and unsafe actions have an effect against work accidents. Together, work shifts combined with unsafe actions affect work accidents, and work fatigue combined with unsafe actions also affects work accidents. More details can be seen Figure 1.

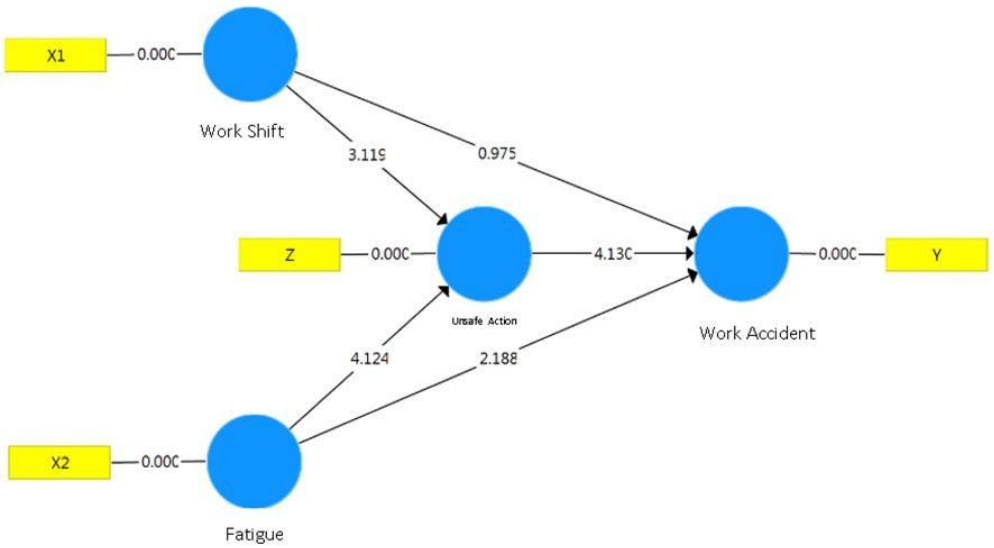

Figure 1 Results of Path Analysis Modeling Using Smartpls 4.

Table 1 The direct effect between variables.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Work Shift -> Unsafe Action	0,313	0,307	0,100	3,119	0,002
Work Fatigue -> Unsafe Action	0,444	0,448	0,108	4,124	0,000
Work Shift -> Work Accident	0,093	0,091	0,095	0,975	0,330
Work Fatigue -> Work Accident	0,249	0,261	0,114	2,188	0,029
Unsafe Action -> Work Accident	0,526	0,514	0,127	4,130	0,000

The findings show that there is an effect of shift work (X1) and work fatigue (X2) on Unsafe Action (Z). It was also found that work accidents (Y) were strongly influenced by work fatigue and unsafe actions, with each P value <0.05. Meanwhile, there was no effect of work shifts (X1) on work accidents (Y), with a p value> 0.05.

Table 2 Intervening test analysis results.

Intervening Test Results	T Statistics (|O/STDEV|)	P Values
Work Shift -> Unsafe Action -> Work Accident	2,550	0,011
Work Fatigue -> Unsafe Action -> Work Accident	2,787	0,006

The findings also show that work shift (X1) combined with unsafe action (Z) will affect work accidents (Y) and that work fatigue (X2) combined with unsafe action (Z) will also affect work accidents (Y), with each p value < 0.05. The magnitude of the influence can be seen by the magnitude of the T value; the greater the T value is, the greater the influence that occurs.

Shift work is a pattern of working time that has been given to workers to do something by the company and is usually divided into morning, afternoon and evening work. The proportion of shift workers is increasing from year to year due to the investment made to purchase machines that require their use continuously day and night to obtain better results. As a result, workers also have to work day and night. Shift work can cause many things to be done positively or negatively. It all depends on how an employee can handle work shifts (Otfiyantoa et al., 2018).

Working shifts and long working hours not only reduce work performance but can also increase the risk of accidents in the company. Llamazares et al. (2021) show that shift workers are 2.7 times more likely to suffer a work injury. Based on the results of research conducted on PT. PLN (Persero) ULP Barru obtained the result that there was no significant relationship between work shifts and the occurrence of work accidents in workers where the statistical test results obtained p (0.975). Because the work shift has a scheduled working time pattern, serious sleep problems will not occur. According to Rudin-Brown et al. (2019), those who work shifts on a scheduled basis can change and adapt to their sleep patterns so that it will not affect work performance, which can reduce the risk of work accidents. One of the control measures to overcome the high number of work accidents is to implement a work shift system. Accidents at work can increase if the workload is excessive. The application of a work shift system aims to reduce one's workload and prevent overtime work.

This is not in line with research conducted by Ratih et al. (2020), which says that there is a relationship between work shifts and work accidents with a p value of 0.014. The existence of work shifts with two shifts that do not vary can result in worker fatigue and decreased performance, which can increase the risk of incidents and accidents. Occupational accidents and health will always be related to fatigue, shifts and work time. Several studies have tried to explain aspects of shifts and working time. Accidents to workers can be caused by lack of experience, training, mastery of the work environment, noncompliance with procedures and a lack of awareness of safe behavior in completing work, which can cause work accidents (Aryanto et al., 2016).

Based on the results of research conducted on PT. PLN (Persero) ULP Barru obtained the result that there was a significant relationship between work fatigue and work accidents in workers where the statistical test results obtained p(0.029). The high incidence of work accidents of more than 50% is caused by fatigue as a human factor that causes unsafe work behavior, so there is a risk of work accidents (Charisma et al., 2022). This research is in line with Hidayat & Febriyanto (2021), who stated that there is a relationship between work fatigue and work accidents. The level of work fatigue on the morning shift is lower than that on the night shift. Workers on the night shift have a 28% higher risk of injury or accident. The fatigue factor that occurs in a worker is one of the causes of the emergence of unsafe actions, which is one of the factors in the occurrence of work accidents (Maurits & Widodo, 2008).

Based on the results of research conducted on PT. PLN (Persero) ULP Barru obtained the result that there was a significant relationship between work shifts and unsafe actions in workers where the statistical test results obtained p (0.002). Based on the results of observations, each work shift shows that workers take unsafe actions while working without using PPE. The results of a similar study conducted by Oktriyawan et al. (2021) regarding the difference in unsafe action

between work shifts in the threading section of production unit I PT X in Surabaya in 2019 show that there is an influence of unsafe action between morning shifts, afternoon shifts and night shifts. The frequency of unsafe action, which was low, decreased in the afternoon shift when compared to the morning shift and decreased again during the night shift. Additionally, it was found that workers carried out unsafe actions with a high category in the night shift, even though unsafe actions with a high category were not found in the morning shift and afternoon shift.

The relationship between work fatigue and unsafe action is in line with the ILCI (International Loss Control Institute) theory that unsafe behavior occurs due to basic causes. These two factors are human factors, namely, physical/physiological stress. Fatigue usually indicates different conditions. -Different from each individual but ultimately resulting in a loss of concentration while working, decreased concentration causes the level of alertness to decrease and the occurrence of decision-making errors when doing work. Based on the results of research conducted on PT. PLN (Persero) ULP Barru obtained the result that there was a significant relationship between work fatigue and unsafe action in workers where the statistical test results obtained p(0.000). It can be concluded that if workers experience fatigue, which is classified as high, then these workers have a greater possibility of carrying out unsafe actions in the work environment. The results of this study are in line with research conducted by (Ramadhany & Pristya, 2019) on workers in the production division of PT Lestari Banten Energi. In this study, using the chi-square test, the results obtained had a p value of 0.008 <α (0.05), which means that there is a significant relationship between work fatigue and unsafe actions.

Some unsafe actions or mistakes by workers that result in injury, namely, working not following occupational health management standards and safety procedures, not using PPE (personal protective equipment) such as gloves, being in a hurry when working so you do not pay attention to the caution that leads to incidents of injury such as slipping, cutting and even hitting several items, misplacing or storing work tools carelessly, and unskilled workers (Akbari et al., 2019).

Based on the results of research conducted on PT. PLN (Persero) ULP Barru obtained the result that there was a significant relationship between unsafe actions and the occurrence of work accidents in workers where the statistical test results obtained p (0.000). Most PLN ULP Barru engineering workers experience work accidents because of this unsafe action factor due to a lack of caution and a lack of concentration at work. This is because the company does not consider the work schedule, which can affect the ongoing work and the lack of supervision of workers in the field. Unsafe behavior (unsafe action) is also strongly influenced by perception factors, work experience and work shifts.

An unsafe act can be interpreted as all actions taken by someone who ignores safety factors, where these actions can endanger themselves, other people, equipment and the environment around them. Based on various kinds of literature, human error is placed at the heart of the problem of work accidents. Eighty-eight percent of work accidents are caused by unsafe acts, 10% by unsafe conditions and 2% by other causes (Mutia et al., 2017). The results of this study are not in line with research conducted by Lombogia et al. (2018) regarding the relationship between unsafe worker behavior and work accidents at PT. Tropica Cocoprima, Lelema Village, South Minahasa Regency. In this study, the results showed that there was no relationship between unsafe worker behavior and work accidents, with a value of p = 1.000. This happened because in this study, the majority of workers who had work accidents were in the low category of unsafe acts.

Based on the results of the research and statistical tests, it can be concluded that the higher the value of the unsafe act factor (unsafe behavior) carried out by engineering workers, the higher the probability of work accidents occurring at PT. PLN (Persero) ULP Barru. Occupational accidents are defined as unexpected events that can cause physical and emotional injury. According to the International Labor Organization, nearly 120 million work accidents occur each year, 210 thousand resulting in fatal injuries due to unsafe acts at work (Niza et al., 2008). Some of the factors that influence unsafe actions that can cause work accidents are workers who have excessive workloads, undirected work shifts, lack of supervision while working, physically unstable workers, work stress (time pressure) and insufficient rest (Kang et al., 2021). The results of research conducted on technical workers of PT. PLN (Persero) ULP Barru obtained the result that there was a significant relationship between work shifts and the occurrence of work accidents with unsafe actions in workers, where the statistical test results obtained p (0.011). It can be concluded that the lack of supervision in the work environment is carried out to monitor workers so that they can carry out work safely, effectively and efficiently and avoid hazards that can cause work accidents.

This research is also similar to the research of Akbari et al. (2019), who said there was a relationship between work shifts and unsafe actions that put them at risk of having work accidents, with a p value (0.005) of work accidents experienced by many workers who did not use PPE and worked in a hurry. Work accidents can be associated with unsafe conditions at work, namely, physical factors such as when the work environment is inadequate, and unsafe actions by workers, namely, individual factors such as inappropriate responses by workers to dangerous situations (Liu & Li, 2022). Unsafe acts are a direct causative factor for accidents, and there is a complex interaction between various factors, including organization, the physical condition of workers, working conditions and work environment (Zhou et al., 2019).

Based on the results of research conducted on PT. PLN (Persero) ULP Barru obtained the result that there was a significant relationship between work fatigue and the occurrence of work accidents with unsafe actions in workers, where the statistical test results obtained p(0.006). This happened because in this study, the majority of workers who had work accidents were in unsafe acts and experienced fatigue while working in the high category. The word tired (fatigue) shows

different physical and mental states, but all of them result in a decrease in working power and reduced body resistance to work. Work fatigue can be characterized by decreased work performance or all conditions that affect all organism processes, including several factors such as subjective feelings of fatigue, decreased motivation, and decreased mental and physical activity.

The results of this study are in line with those carried out by factors related to unsafe acts in production workers at PT. Sermani Steel. Shows that there is a significant influence between work fatigue and unsafe action (Yusril et al., 2020) impact on work accidents where the statistical test results obtained p (0.000). The research argues that there is a relationship between work fatigue and unsafe actions because the cause of a person experiencing fatigue is insufficient calorie needs, extreme work environments such as hot temperatures, inappropriate work or rest times, and physical and mental work activities causing decreased concentration and motivation. work, many mistakes occur, stress due to work, and can lead to work accidents.

4. Conclusions

The findings show that after conducting a modeling test using the smart PLS4 application, the results show that in a single line, work shifts do not affect work accidents, work fatigue affects work accidents, work shifts affect unsafe actions, work fatigue affects unsafe actions, and unsafe actions have an effect against work accidents. Together, work shifts combined with unsafe actions affect work accidents, and work fatigue combined with unsafe actions also affects work accidents. The research results provide input for PT. PLN (Persero) especially in carrying out unsafe actions which poses a risk of work accidents for workers and employee at PLN. In addition, contribute to knowledge in accident management and work safety that can have an impact on workers. for further research, the population and number of research samples can be expanded.

Acknowledgements

Author thanks the entire academic community, doctorate of public health, Hasanuddin University.

Ethical considerations

I confirm that I have obtained all consent required by the applicable law to publish any personal details or images of patients, research subjects, or other individuals used (Universitas Hasanuddin, Indonesia - Protocol number: 20123062012). I agree to provide Multidisciplinary Science Journal with copies of the consent or evidence that such consent has been obtained if requested.

Conflict of Interest

No potential conflict of interest was reported by the authors.

Funding

This research did not receive any financial support.

References

Abubakar, I. I.; TIillmann, T.; Banerjee, A. (2015). Europe PMC Funders Group GlobMENDONÇA, M. F. S. Incidência De Transtorno Mental Comum E Violência Por Parceiro Íntimo. 2015. p. 1–8. al, regional, anMENDONÇA, M. F. S. Incidência De Transtorno Mental Comum E Violência Por Parceiro Íntimo. 2015. p. 1–8. *Lancet (London, England)*, *385*(9963), 117–171. https://doi.org/10.1016/S0140-6736(14)61682-2.Global

Akbari, H., Kashani, M., Asadi, Z., Kaveh, M., & Hannani, M. (2019). The correlation between occupational unsafe acts and job burnout among workers in kashan metal melting industries 2017. *International Archives of Health Sciences*, *6*(4), 148. https://doi.org/10.4103/iahs.iahs_38_19

Akbari, H., Kashani, M., Asadi, Z., Kaveh, M., & Saberi, H. (2019). The relationship between job satisfaction and the incidence of unsafe acts in metal smelting industry workers in 2017. *International Archives of Health Sciences*, *6*(3), 127. https://doi.org/10.4103/iahs.iahs_40_19

Al-Refaie, A. (2013). Factors affect companies' safety performance in Jordan using structural equation modeling. *Safety Science*, *57*(March), 169–178. https://doi.org/10.1016/j.ssci.2013.02.010

Aryanto, L., Ekawati, & Kurniawan, B. (2016). Hubungan Pelatihan , Status Kerja, Latar Kerja Pada Total E & P Indonesie. *Jurnal Kesehatan Masyarakat*, *4*(2356–3346), 457–467.

Behn, C., & Gregorio, N. De. (2020). Melatonin Relations with Energy Metabolism as Possibly Involved in Fatal Mountain Road Traffic Accidents. *International Journal of Molecular Sciences*, *21*(2184), 1–22.

Bhadke, M., & Rehman, M. A. A. (2022). Consequences of Shift Work in Industry : A Critical Review. *Journal of Ergonomis*, *12*(2), 1–6. https://doi.org/10.35248/2165-7556-22.12.302

Charisma, R., Mandagi, P., Sondakh, R. C., Maddusa, S., Kesehatan, F., Universitas, M., Ratulangi, S., & Abstrak, M. (2022). Hubungan Kelelahan Kerja dengan Kejadian Kecelakaan Kerja di PT. Putra Karangetang Desa Popontolen Kabupaten Minahasa Selatan. *Jurnal KESMAS*, *11*(4), 28–34.

Chipman, M. L. (1995). Risk factors for injury: Similarities and differences for traffic crashes and other causes. *Accident Analysis and Prevention*, *27*(5), 699–706. https://doi.org/10.1016/0001-4575(95)00013-P

Cooper, M. D., & Phillips, R. A. (2004). Exploratory analysis of the safety climate and safety behavior relationship. *Journal of Safety Research*, *35*(5), 497–512. https://doi.org/10.1016/j.jsr.2004.08.004

Dyreborg, J., Lipscomb, H. J., Nielsen, K., Törner, M., Rasmussen, K., Frydendall, K. B., Bay, H., Gensby, U., Bengtsen, E., Guldenmund, F., & Kines, P. (2022). Safety interventions for the prevention of accidents at work: A systematic review. *Campbell Systematic Reviews*, *18*(2). https://doi.org/10.1002/cl2.1234

Frone, M. R. (1998). Predictors of work injuries among employed adolescents. *Journal of Applied Psychology*, *83*(4), 565–576. https://doi.org/10.1037/0021-9010.83.4.565

Global Road Safety Facility & IHME. (2014). The Global Burden of Disease from Motorized Road Transport. In *The World Bank and Institute for Health Metrics and Evaluation (IHME)*.

Gyedu, A., Nakua, E. K., Otupiri, E., Mock, C., Donkor, P., & Ebel, B. (2015). Incidence, Characteristics and Risk Factors for Household and Neighborhood Injury among Young Children in Semi-Urban Ghana: A Population-Based Household Survey. *Inj Prev.*, *21*(April), 71–79. https://doi.org/10.1177/0022146515594631.Marriage

Hämäläinen, P., Takala, J., & Saarela, K. L. (2006). Global estimates of occupational accidents. *Safety Science*, *44*(2), 137–156. https://doi.org/10.1016/j.ssci.2005.08.017

HARRELL, W. A. (1990). Perceived Risk of Occupational Injury: Control Over Pace of Work and Blue-Collar Versus White-Collar Work. *Perceptual and Motor Skills*, *70*(4), 1351. https://doi.org/10.2466/pms.70.4.1351-1359

Hidayat, R., & Febriyanto, K. (2021). Hubungan Kelelahan Kerja Dengan Kejadian Kecelakaan Kerja Pada Penyelam Tradisional Di Pulau Derawan Provensi Kalimantan Timur. *Borneo Student Research*, *2*(2), 1045–1051.

Hsu, S. H., Lee, C. C., Wu, M. C., & Takano, K. (2008). A cross-cultural study of organizational factors on safety: Japanese vs. Taiwanese oil refinery plants. *Accident Analysis and Prevention*, *40*(1), 24–34. https://doi.org/10.1016/j.aap.2007.03.020

ILO. (2015). Investigation of Occupational Accidents and Diseases: A Practical Guide for Labour Inspectors. In *International Labour Office* (Vol. 11, Issue 2).

Kang, S., Cho, S., Yun, S., & Kim, S. (2021). Semantic network analysis using construction accident cases to understand workers' unsafe acts. *International Journal of Environmental Research and Public Health*, *18*(23), 1–14. https://doi.org/10.3390/ijerph182312660

Laflamme, L., Menckel, E., & Lundholm, L. (1996). The age-related risk of occupational accidents: The case of swedish iron-ore miners. *Accident Analysis and Prevention*, *28*(3), 349–357. https://doi.org/10.1016/0001-4575(96)00001-2

Laurie, a. (1998). Report III Statistics of occupational injuries. *International Labour Organization*, *October*, 1–64.

Liu, X., & Li, X. (2022). Exploring the Formation Mechanism of Unsafe Construction Behavior and Testing Efficient Occupational Health and Safety (OHS) Programs. *International Journal of Environmental Research and Public Health*, *19*(4), 1–19. https://doi.org/10.3390/ijerph19042090

Llamazares, J., Useche, S. A., Montoro, L., & Alonso, F. (2021). Commuting accidents of Spanish professional drivers: when occupational risk exceeds the workplace. *International Journal of Occupational Safety and Ergonomics*, *27*(3), 754–762. https://doi.org/10.1080/10803548.2019.1619993

Lombogia, O., Kawatu, P. A. T., & Sumampouw, O. J. (2018). The Relationship Between Unsafe Worker Behavior With Work Accidents At PT. Tropica Cocoprima, Lelema Village, South Minahasa Regency. *Kesehatan Masyarakat*, *7*(5), 1–7.

Maurits, L. S., & Widodo, I. D. (2008). Faktor dan Penjadualan Shift Kerja. *Teknoin*, *13*(2), 18–22. https://doi.org/10.20885/teknoin.vol13.iss2.art4

Mutia, A. A., Ekawati, & Wahyuni, I. (2017). ANALISIS FAKTOR-FAKTOR YANG BERHUBUNGAN DENGAN PERILAKU TIDAK AMAN PADA PEKERJA DI DEPARTEMEN PRODUKSI PT. X. *JURNAL KESEHATAN MASYARAKAT*, *5*(5), 1–9.

Neal, A., Gri, M. A., & Hart, P. M. (2000). Neal 2000 SafetySci org climate impact on behav! *Journal Individual Behaviour*, *34*(1), 99–109.

Nivolianitou, Z., Konstandinidou, M., & Michalis, C. (2006). Statistical analysis of major accidents in petrochemical industry notified to the major accident reporting system (MARS). *Journal of Hazardous Materials*, *137*(1), 1–7. https://doi.org/10.1016/j.jhazmat.2004.12.042

Niza, C., Silva, S., & Lima, M. L. (2008). Occupational accident experience: Association with workers' accident explanation and definition. *Safety Science*, *46*(6), 959–971. https://doi.org/10.1016/j.ssci.2007.11.015

Oktriyawan, Y., Purnomo, H., & Oktyajati, N. (2021). Analisis Pemakaian Alat Pelindung Diri pada Tenaga Kerja Antar-Shift Kerja di Unit Produksi PT. XYZ sebagai Upaya Mengendalikan Risiko di Tempat Kerja. *Go-Integratif : Jurnal Teknik Sistem Dan Industri*, *2*(01), 50–59. https://doi.org/10.35261/gijtsi.v2i01.5106

Oliver, A., Cheyne, A., Tomás, J. M., & Cox, S. (2002). The effects of organizational and individual factors on occupational accidents. *Journal of Occupational and Organizational Psychology*, *75*(4), 473–488. https://doi.org/10.1348/096317902321119691

Otfiyantoa, O., Muhtarom, A., Ismail, H. B., & Mahmudah, H. (2018). The Influence Of The Working Shift Work And Stress On The Performance Of The Employes. *Akuisisi: Jurnal Akuntansi*, *14*(1), 52–58. https://doi.org/10.24127/akuisisi.v14i1.250

Oze, I., Matsuo, K., Ito, H., Wakai, K., Nagata, C., Mizoue, T., Tanaka, K., Tsuji, I., Tamakoshi, A., Sasazuki, S., Inoue, M., Tsugane, S., Inoue, M., Sasazuki, S., Iwasaki, M., Otani, T., Sawada, N., Shimazu, T., Tsuji, I., … Tanaka, K. (2012). Cigarette smoking and esophageal cancer risk: An evaluation based on a systematic review of epidemiologic evidence among the Japanese population. *Japanese Journal of Clinical Oncology*, *42*(1), 63–73. https://doi.org/10.1093/jjco/hyr170

Ramadhany, F. A., & Pristya, T. Y. R. (2019). Faktor-Faktor yang Berhubungan dengan Tindakan Tidak Selamat (Unsafe Act) pada Pekerja di Bagian Produksi PT Lestari Banten Energi. *Jurnal Ilmiah Kesehatan Masyarakat*, *11*(2), 199–205.

Ratih, R. M., Muliatini, N., & Suhendi, R. M. (2020). Pengaruh Shift Kerja Terhadap Efektivitas Kerja Pegawai (Suatu Studi pada PT BKS (Berkat Karunia Surya) di Kota Banjar. *Business Management and Entreprenuership Journal*, *2*(1), 66–77.

Reason, J. (2016). *Managing the risks of organizational accidents*. Taylor & Francis.

Rudin-Brown, C. M., Harris, S., & Rosberg, A. (2019). How shift scheduling practices contribute to fatigue amongst freight rail operating employees: Findings from Canadian accident investigation. *Accident Analysis and Prevention*, *126*(September 2017), 64–69. https://doi.org/10.1016/j.aap.2018.01.027

Seo, D. C. (2005). An explicative model of unsafe work behavior. *Safety Science*, *43*(3), 187–211. https://doi.org/10.1016/j.ssci.2005.05.001

Sklet, S. (2004). Comparison of some selected methods for accident investigation. *Journal of Hazardous Materials*, *111*(1–3), 29–37. https://doi.org/10.1016/j.jhazmat.2004.02.005

Sklet, S. (2006). Hydrocarbon releases on oil and gas production platforms: Release scenarios and safety barriers. *Journal of Loss Prevention in the Process Industries*, *19*(5), 481–493. https://doi.org/10.1016/j.jlp.2005.12.003

Stanaway, J. D., Afshin, A., Gakidou, E., Lim, S. S., Abate, D., Abate, K. H., Abbafati, C., Abbasi, N., Abbastabar, H., Abd-Allah, F., Abdela, J., Abdelalim, A., Abdollahpour, I., Abdulkader, R. S., Abebe, M., Abebe, Z., Abera, S. F., Abil, O. Z., Abraha, H. N., … Murray, C. J. L. (2018). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Stu. *The Lancet*, *392*(10159), 1923–1994. https://doi.org/10.1016/S0140-6736(18)32225-6

Takala, J., Hämäläinen, P., Saarela, K. L., Yun, L. Y., Manickam, K., Jin, T. W., Heng, P., Tjong, C., Kheng, L. G., Lim, S., & Lin, G. S. (2014). Global estimates of the burden of injury and illness at work in 2012. *Journal of Occupational and Environmental Hygiene*, *11*(5), 326–337. https://doi.org/10.1080/15459624.2013.863131

Wells, S., & MacDonald, S. (1999). The relationship between alcohol consumption patterns and car, work, sports and home accidents for different age groups. *Accident Analysis and Prevention*, *31*(6), 663–665. https://doi.org/10.1016/S0001-4575(99)00025-1

Wong, J. M., Arico, M. C., & Ravani, B. (2011). Factors influencing injury severity to highway workers in work zone intrusion accidents. *Traffic Injury Prevention*, *12*(1), 31–38. https://doi.org/10.1080/15389588.2010.525569

Yusril, M., Alwi, M. K., & Hasan, H. (2020). FAKTOR YANG BERHUBUNGAN DENGAN TINDAKAN TIDAK AMAN (UNSAFE ACTION) PADA PEKERJA BAGIAN PRODUKSI PT. SERMANI STEEL. *Window of Public Health Journal*, *1*(4), 370–381.

Zhou, C., Chen, R., Jiang, S., Zhou, Y., Ding, L., Skibniewski, M. J., & Lin, X. (2019). Human dynamics in near-miss accidents resulting from unsafe behavior of construction workers. *Physica A: Statistical Mechanics and Its Applications*, *530*(June), 121495. https://doi.org/10.1016/j.physa.2019.121495