



FACTOR RELATED FATIGUE IN OIL AND GAS WORKER: LITERATURE REVIEW

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Abstract

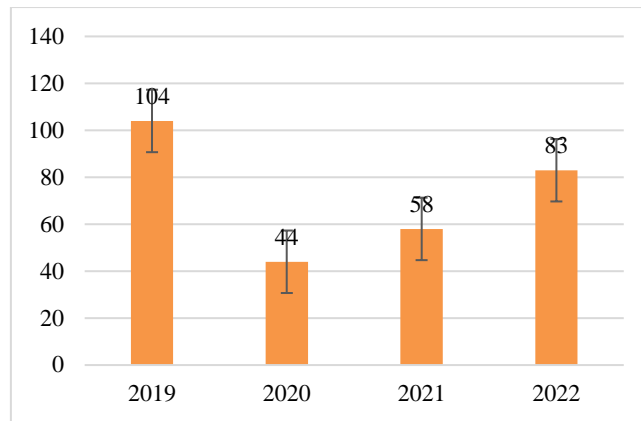
Oil and gas workers are faced with environmental conditions that are at risk of experiencing work fatigue. The perceived work fatigue has an impact on reducing the level of work concentration, if this condition is left unchecked it will increase the risk of work accidents. This research aims to determine the factors associated with work fatigue in oil and gas workers. This research aims to determine the factors associated with work fatigue in oil and gas workers. Research methods used in literature review with the PRISMA approach (preferred reporting items for systematic reviews and meta-analyses). In the journal search carried out on a database google scholar and ScienceDirect with the keywords "work fatigue" and "Oil and gas Industry Workers". A total of 806 journals were identified, but 6 journals met the inclusion and exclusion criteria. Based on 6 journals that met the inclusion and exclusion criteria, it was found that the factors that influence work fatigue felt by workers are: work related factors (shift work, ergonomic, workload, night shift, noise, heat stress) And individual factors (sleep quality, motivation, respiratory rate, blood pressure). The impact of work fatigue felt by workers increases the risk of work accidents and reduces work productivity. It can be concluded that the factors related to work fatigue are work-related factor and individual factor.

Keywords: Individual Factor, Oil and Gas Worker, Work Fatigue, Work Related Factor

Introduction

Work fatigue is a tired condition felt by workers because of their work, lack of sleep, stress or prolonged feelings of anxiety (1). Work fatigue is a problem that arises in workers which is influenced by several factors, namely work conditions, workload, disrupted circadian rhythms, social environment and lack of sleep (2). Based on research that has been conducted, it is concluded that most of the work fatigue felt is caused by a lack of sleep or good quality sleep (3) if this condition is left unchecked, it will increase the risk of work accidents (4).

The oil and gas sectors are a sector whose function is vital to support the economy (5) (6). However, oil and gas workers are faced with environmental conditions that are at risk of increasing work fatigue (7). Extreme weather conditions, quite noisy work environments and work schedule patterns that use a shift system can cause work fatigue (8). Work fatigue felt by oil and gas workers has an impact on increasing the risk of work accidents (9). The following is data on accidents in the oil and gas sector privat oil and gas companies from 2019 to 2022, can be seen in Figure 1, as follows.



Source: U.S Bureau of Labor Statistics, 2023

Figure 1 Occupational Accidents in Indonesia 2019-2021

Based on the graph in Figure 1, the number of work accidents in the oil and gas sector in 2019 was 104 incidents, work accidents decreased in 2020 with the number of work accidents occurring at 44. Work accidents increased in 2021 with the number of work accidents occurring at 58 incidents and will increase again in 2022 to 83 work accidents. The high risk of work accidents threatens oil and gas workers, directly impacting the economy, the environment, injuries and, most seriously, death (10). Data compiled by (11) states that 13% of work accidents are caused by work fatigue. Besides increasing the risk of work accidents, work fatigue has an impact on reducing work productivity (12).

Work fatigue is very complex and there may be many things that trigger workers to experience work fatigue. Research that has been conducted reveals factors that influence work fatigue, including working period, respiratory rate, blood pressure, noise exposure, heat stress exposure (13) work system with shift rotation (14). In addition, the work system for workers in the oil and gas sector applies to shifts like shift 4-time rotation, or two weekdays shift tends to make workers experience higher levels of fatigue and fatigue-related work accidents (7).

Method

This research uses a literature review study method, with the "PRISMA" approach. Preferred Reporting Items for Systematic reviews and Meta-Analyses (15). Searching for relevant journals is done on databases" Google Scholar" And "ScienceDirect", using the keyword "work fatigue" And "oil and gas worker" who meet the inclusion and exclusion criteria. Inclusion criteria are Factors Related Work Fatigue Oil and Gas Worker on oil and gas workers using quantitative research methods. Meanwhile, the exclusion criteria are research conducted before 2019, and the object of research conducted other than oil and gas workers. The following are the stages of a literature review study using the "PRISMA" approach Preferred Reporting Items for Systematic reviews and Meta-Analyses, can be seen in Figure 1, as follows.

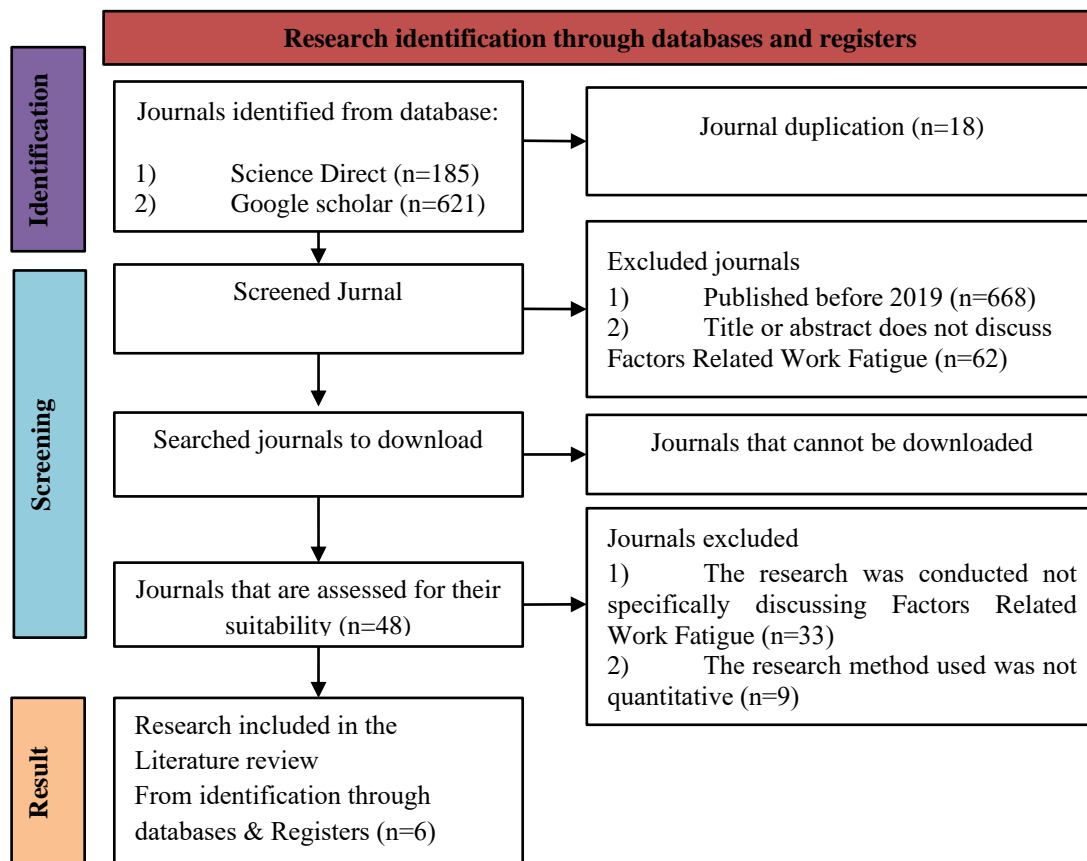


Figure 2 Step “PRISMA” Methode

Referring to Figure 2 above, a total of 806 were identified as originating from ScienceDirect as many as 185 journals as and Google Scholar as many as 621. Excluded 18 journals because there were duplications, so the remaining 788 journals. Screening was carried out, excluding 688 journals because they were published before 2019 and 62 journals because the abstract did not focus on discussing Factors Related Work Fatigue, so the remaining 58 journals. There are 10 journals that cannot be downloaded so there are 48 journals remaining. Screening was carried out by excluding journals that did not specifically explain Factors Related Work Fatigue; there were 33 journals and 9 journals that did not use quantitative methods. So, 6 journals were selected, with 3 journals indexed Q1, 2 journals indexed Q2 and 1 journal indexed Q4.

Results

The research results obtained were 6 journals, with 3 journals indexed Q1, 2 journals indexed Q2 and 1 journal indexed Q4 which were relevant to the research topic. The following is a summary of the research results, which can be seen in Table 1, as follows.

Table 1 Summary Research result

No	Author, Year	Title	Research Methode, instrument	Result	Interprestation
(1)	(2)	(3)	(4)	(5)	(6)
1	V.Riethmeiste, R.W.Matthews, D. Dawson, M.R. de Boer, S. Brouwer, U. Bültmann, 2019	Time-of-day and days-on-shift predict increased fatigue over two-week offshore day-shifts	Quantity with cross section study, instrument by questionnaire	1. Shift 2 minggu – work fatigue p-value 0.042 2. Less sleep – work fatigue p-value 0.020	1. Based on The results of the study revealed that 2-week rotation shifts were associated with work fatigue 2. Lack of sleep is related to work fatigue
2	Ahmad Bazazan, Yousuf Noman, Hadis Norouzi, Azam Maleki-Ghahfarokhi, Parvin Sarbakhsh, Iman Dianat, 2023	Physical and psychological job demand and fatigue experience among offshore workers	Quantity with cross section study, instrument by questionnaire	1. 88.4% felt they experienced work fatigue, and 11.6% did not feel they experienced work fatigue 2. Nilai p-value a. Motivation 0.001 b. Ergonomic 0.001 c. Physical load 0.003	1. Based on the research results, 88.4% felt they experienced work fatigue, and 11.6% did not feel they experienced work fatigue 2. Bivariate analysis results a. Motivation is related to work fatigue b. Ergonomics is related to work fatigue c. Physical load is related to work fatigue
3	Iwan Muhamad Ramdan, Krishna Purnawan Candra, Ulfah Rana Mahdiyyah, 2021	Fatigue on Oil Refinery Workers and Related Factors	Quantity with cross section study, instrument by questionnaire	1. 8.6% felt low fatigue, 49.2% mrsa medium fatigue, 27.9% mersa high fatigue 2. Nilai p-value, r a. Working hours 0.037, 0.274 b. Respiratory rate 0.026, 0.852 c. Blood pressure 0.047, 0.274 d. Noise 0.000, 0.248 (significant) e. Heat stress	1. Based on the research results, it shows that 8.6% feel low fatigue, 49.2% mrsa medium fatigue, 27.9% mersa high fatigue 2. The results of the bivariate analysis show that a. Working hours are related and correlated with work fatigue b. Respiratory rate is related and strongly correlated with work fatigue

No	Author, Year	Title	Research Methode, instrument	Result	Interpretation
(1)	(2)	(3)	(4)	(5)	(6)
				0.030, 0.656 (significant)	c. Blood pressure is related and correlated with work fatigue d. Noise is significantly related and correlated with work fatigue e. Heat stress is significantly related to work fatigue
4	Al-Baraa Abdulrahman Al-Mekhlafi, Ahmad Shahrul Nizam Isha, Nicholas Chileshe, Mohammed Abdulrab, Anwar Ameen Hezam Saeed, Ahmed Farouk Kineber, 2021	Modelling the Relationship between the Nature of Work Factors and Driving Performance Mediating by Role of Fatigue	Quantity with cross section study, analysis technique by PLS-SEM instrument by questionnaire	1. 8.6% felt low fatigue, 49.2% mrsa medium fatigue, 27.9% mersa high fatigue 2. Nilai p-value, r a. Working hours 0.037, 0.274 b. Respiratory rate 0.026, 0.852 c. Blood pressure 0.047, 0.274 d. Noise 0.000, 0.248 (significant) e. Heat stress 0.030, 0.656 (significant)	Based on the PLS-SEM test results 1. Work schedule has a significant effect on work fatigue, with a strong influence 2. Workload has a significant effect on work fatigue, with a moderate effect 3. Work fatigue has a significant effect on employee performance, with a strong influence
5	Ranjana K. Mehta, S. Camille Peres, Pranav Kannan, Joohyun Rhee, Ashley E. Shortz, M. Sam Mannan, 2019	Comparison of objective and subjective operator fatigue assessment methods in offshore shiftwork	Quantity with cross section study, instrument by questionnaire	1. Nilai p-value a. Work schedule 0.000 b. Workload 0.00 c. Fatigue-performance 0.000 2. Big influence a. Work schedule strong b. Moderate workload c. Fatigue to performance strong	Based on the research results, it shows that 1. Night shift is related to work fatigue 2. Changing shifts is related to work fatigue
6	David Kusmawan, M Dody Izhar,	Assessing the relationship between mental	Quantity with cross section study,	Nilai p-value 1. Night shift 0.007 2. Swing shift 0.03	Based on the results of PLS-SEM analysis, it shows that

No	Author, Year	Title	Research Methode, instrument	Result	Interpretation
(1)	(2)	(3)	(4)	(5)	(6)
	Budi Aswin, 2024	workload and work fatigue among oil and gas workers in PT X, Jambi Province, Indonesia: PLS-SEM analysis	analysis technique by PLS-SEM instrument by questionnaire		<ol style="list-style-type: none"> 1. Mental load influences work fatigue with a large influence of 40.5% 2. Sleep quality influences work fatigue with a large influence of 17.9%.

Discussion

Based on the research results of 6 journals, with 3 journals indexed Q1, 2 journals indexed Q2 and 1 journal indexed Q4. Factors associated with work fatigue in oil and gas workers can be categorized into 2 factors, namely *work-related factors* and *individual factors* (16), can be seen in Figure 3, as follows.

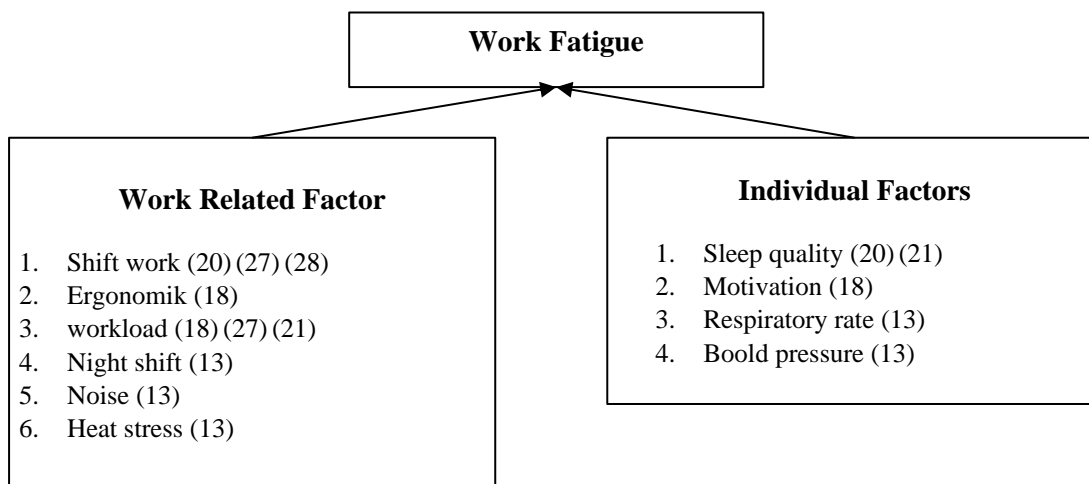


Figure 3 Factors Associated Work Fatigue

Based on the research results, it is revealed that the work fatigue felt by oil and gas workers is influenced by 2 factors, namely *work related factor* and individual. Work related factors consist of shift work, ergonomics, workload, working hours, noise and heat stress. Whereas *individual factor* is *sleep quality, motivation, BMI, education, respiratory* And *blood pressure*. The work system used in the oil and natural gas industry mostly uses a 2-week work system or 8-hour rotation shift (14). Shift work affects the circadian rhythm where the body recognizes when it is daytime for activities and at night it is time for the body to rest after doing activities, which condition triggers work fatigue. (17). His research revealed that 84.6% of workers experienced fatigue while only 13.14% of workers did not experience fatigue (18). Disruption of rhythm circadian triggers workers who work during the night shift not to concentrate while working (13), thus increasing the risk of work accidents (19).

In the upstream oil and natural gas industry, most apply a 2-week shift work system. Where are the employees working in the beginning shift does not experience fatigue, in contrast to the end of the shift where worker fatigue accumulates after working for 2 (14). Most workers experience sleep disturbances while working on a 2-week work system. Research shows that sleep quality influences work fatigue (20)(21). The occurrence of physical, mental and behavioral changes in workers, as a result of rhythm circadian Distracted workers threaten workers' health (22). Risks that may threaten

workers as a result of shift work which affects sleep quality include health conditions and an increased risk of work accidents (23). It can be made worse if workers lose more than 6 hours of sleep bother neurobehavioral function in healthy adults (24).

The working environment of the petroleum industry is mostly located offshore with a high workload, coupled with equipment that produce heat, dirty air and excessive noise increase the occurrence of work fatigue (13). Work is carried out physically as well as surfaces with temperature high that is done repeatedly in doing his job, is the workload felt by workers, as a result oil and gas workers are vulnerable to work fatigue (18). Physical work such as lifting, lowering, shifting with inappropriate body positions and done repeatedly (18) triggers physical fatigue felt by oil and gas workers. It is made worse if workers have little rest time to recover, causing decreased stamina and excessive fatigue (21).

Apart from poor working environment conditions, it influences the work fatigue felt by the employee, oil and natural gas (13). The oil and gas industry produces toxic exhaust gases, which have an impact on health, especially the respiratory system of workers (25). Short-term shortness of breath may be felt as an effect of exposure to toxic gas, and long-term it can result in death for workers (19). Breathe normally by inhaling oxygen and expelling carbon dioxide and water vapor. Conditions will be different if it is an industrial environment where the carbon dioxide content increases 2 times compared to residential areas (26). Blood pressure and respiratory rate above normal limits will affect oxygen in the blood flow throughout the body, which will cause work fatigue (13).

Lack of concentration in complying with occupational safety and health rules when carrying out work increases the risk of work accidents (19). Research that has been conducted reveals that 70% of oil and gas workers cannot concentrate while working, while 30% of workers can concentrate when working (19). Besides that, work fatigue has an impact on workers not working by paying attention to the quality and quantity of work, thereby reducing the level of work productivity

Conclusion

Based on the research results, it was found that factors influence work fatigue felt by workers, namely work-related factors (shift work, ergonomic, workload, night shift, noise, heat stress) And individual factors (sleep quality, motivation, respiratory rate, blood pressure). The impact of work fatigue felt by workers increases the risk of work accidents because of lack of concentration when working and can reduce work productivity.

From the research results *sleep management* can be applied, so that the body's recovery time is fulfilled so that it can reduce work fatigue. Bearing in mind that lack of hours of sleep and sleep quality as well as poor circadian rhythms are often found to be factors causing work fatigue in oil and gas workers

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