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Relationship Between Worker Age And Work Shifts With Work Fatigue Among Security Guards At Pt. Pertamina Geothermal Energy Area Lahendong

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ABSTRACT

Work fatigue is a major occupational health and safety concern because it increases the risk of work-related accidents and decreases overall performance. Fatigue is a complex condition that includes not only physical and psychological exhaustion but also reduced physical performance, feelings of tiredness, decreased motivation, and lower work productivity. Many factors can influence work fatigue, such as individual characteristics including age, gender, length of service, and nutritional status, as well as job-related factors like workload, work environment, and working time arrangements, particularly shift work. This study aimed to determine the relationship between worker age and work shifts with work fatigue among security personnel at PT Pertamina Geothermal Energy Lahendong Area. The research used a quantitative approach with an analytic observational design and applied a cross-sectional study method. Data collection was carried out in June 2023 involving 71 security workers as respondents.Statistical analysis was conducted to examine the correlation between age and work fatigue and between work shifts and work fatigue. The results showed that there was no significant relationship between age and work fatigue, indicated by a p-value of 0,640. Similarly, the analysis of work shifts and fatigue showed no statistically significant relationship, with a p-value of 0,082. Although the correlation coefficient for work shifts and fatigue was 0.496, no significant association, the result did not reach statistical significance.In conclusion, this study found that worker age and work shift were not significantly associated with work fatigue among security workers at PT Pertamina Geothermal Energy Lahendong Area overall.

Keywords *: Work fatigue ; Age ; Work shift ; Worker ; Security guards.*

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INTRODUCTION

Work fatigue is a critical issue in occupational health and safety, with global implications across various industries, especially in high-risk professions such as security and shift work(1,2). Fatigue at work can lead to a reduction in performance, increased risk of accidents, and lower productivity . According to the World Health Organization (WHO)(3), the global burden of work-related fatigue is linked to a significant increase in workplace accidents, with studies suggesting that fatigue can impair cognitive function and physical performance. On a national level, research in Indonesia has shown that fatigue among workers is prevalent in sectors that require long working hours, such as manufacturing, mining, and energy . Particularly, in the context of the energy sector, where operations extend over multiple shifts, the issue of work fatigue is further exacerbated by long, irregular working hours . The potential for fatigue-related accidents is especially significant in critical infrastructures like geothermal energy plants, where precision and alertness are required in potentially hazardous environments.

Locally, at PT Pertamina Geothermal Energy Lahendong, the issue of security personnel fatigue due to shift work has been a topic of concern. Security personnel, who are often required to work in rotating shifts, are at a higher risk of experiencing physical and mental fatigue. A study conducted by Nabila (2022) highlighted that workers in similar settings showed varied levels of fatigue depending on the time of day and length of their shifts . However, research focusing specifically on security officers in geothermal energy areas remains limited, making this study significant in addressing this gap (4).

A general background review of the existing literature shows that age and shift work are two critical factors influencing work fatigue. Various studies have examined the relationship between age and fatigue, with findings suggesting that older workers may experience greater levels of fatigue due to physical and cognitive limitations . Like wise, shift

work has been identified as a major contributor to work fatigue, with night shifts, in particular, being associated with higher fatigue levels due to misalignment with the body's natural circadian rhythm (5). Despite these insights, there is a lack of comprehensive studies exploring how these two factors age and shift work interact specifically within the security workforce at PT Pertamina Geothermal Energy Lahendong (6,7).

METHODS

This research employs a quantitative approach with an observational analytic design. The study was conducted at PT Pertamina Geothermal Energy Lahendong, located in North Sulawesi, Indonesia, in June 2023. The research aimed to investigate the relationship between worker age and shift work with job fatigue among security personnel at the geothermal energy plant. The population for this study consisted of 71 security personnel working at PT Pertamina Geothermal Energy Lahendong. The sample was selected total sampling, ensuring that every security worker had an equal chance of being included in the study. Inclusion criteria required participants to be security staff aged 18 years or older, actively working at the plant, and willing to participate in the research. Exclusion criteria included workers on leave or with physical disabilities that could impair their ability to participate in the study.

Data collection was carried out using structured questionnaires, which included demographic questions, work-related factors (such as shift work and age), and a subjective fatigue scale adapted from the Industrial Fatigue Research Committee (IFRC)(8). The Subjective Self-Rating Test from the Industrial Fatigue Research Committee (IFRC) of Japan is a questionnaire designed to measure levels of subjective fatigue. The questionnaire consists of 30 items regarding general symptoms of fatigue. After completing the interview and filling out the questionnaire, the next step is to calculate the scores for the 30 questions

and sum them to obtain an individual total score. This questionnaire was subsequently developed such that responses are scored according to a four-point Likert scale(7).

This scale assessed fatigue based on self-reported physical, mental, and emotional fatigue levels. The data analysis was performed using SPSS version 26, where descriptive statistics (frequencies, percentages, means, and standard deviations) were first calculated to describe the sample characteristics (9).

RESULTS

The study sample comprised 71 security personnel from PT Pertamina Geothermal Energy Lahendong, consisting of both male and female participants. The demographic characteristics of the respondents are summarized in table 1. The sample included a higher proportion of male respondents (78.9%) compared to females (21.1%). In terms of age distribution, 52.1% of the respondents were aged between 25 and 35 years, while the remaining 47.9% were aged between 36 and 45 years. The respondents had varying levels of experience, with the majority (60.6%) having worked at the company for 2-5 years, and 39.4% had more than 5 years of service.

Table 1
Distribution of Respondents Based on Age

Age Category	n	%
Period teeneger end (17-25 years old)	2	2,8
Period mature beginning (26-35 years old)	35	49,3
Period mature end (36-45 years old)	18	25,4
Period elderly beginning (46-55 years old)	13	18,3
Period elderly end (56-65 years old)	3	4,2
Total	71	100

Source: Primary Data, 2025

Table 1 shows that most respondents were in the early adulthood category, aged 26–35 years, accounting for 49.3% of the total sample. In contrast, the fewest respondents were in the late elderly category (56–65 years), comprising only 4.2% of the respondents.

Table 2
Respondent Characteristics Based on Shift Location

Shift Location	n	%
Cluster	27	38,0
Control Post	3	4,2
Rooms 1-4	12	16,9
Office Post	5	7,0
Complex Post	4	5,6
Housing 1	3	4,2
Complex Post	3	4,2
Housing 2	4	5,6
LHD 2 Post	7	9,9
LHD 32 Post	3	4,2
Total	71	100

Source: Primary Data, 2025

Table 2 shows that the shift locations of respondents varied, with security personnel most frequently assigned to cluster locations, accounting for 38.0% of the total respondents. In contrast, the fewest respondents were assigned to the control post, housing 1, complex post, and LHD 32 post locations, each representing 4.2% of the respondents.

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Table 3
Cross Tabulation between Respondent Characteristics and Age Variable

Gender	Age						
	Period Teenager end	Period mature beginning	Period mature end	Period elderly beginning	Period elderly end	N	Total %
Men	2	34	18	13	3	70	98,6
Female	0	1	0	0	0	1	1,4
Total	2	35	18	13	3	71	100%

Source: Primary Data, 2025

Table 3 shows that the majority of security personnel were male, with 34 respondents in the early adulthood age category (26–35 years). Overall, 70 respondents, or 98.6% of the total sample, were male, while only 1 respondent (1.4%) was female..

Table 4
Distribution of Respondents Based on Shifts

Work Shift	n	%
Morning	31	43,7
Afternoon	21	29,6
Night	19	26,8
Total	71	100

Source: Primary Data, 2025

Table 4 shows that the distribution of respondents based on the most common work shift is the morning shift, with 31 security guards or 43.7%. The distribution based on the least common shift is the night shift, with 19 security guards or 26.8%.

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Table 5
Fatigue Category

Work Fatigue Category	n	%
Low (30-52)	59	83,1
Moderate (53-75)	10	14,1
High (76-98)	2	2,8
Very High (99-120)	0	0
Total	71	100

Source: Primary Data, 2025

Based on the distribution of work fatigue frequency of respondents in Table 5, it is known that more than half of the work fatigue is in the Low range with a score of 30-52, namely 59 respondents with a percentage of (83.1%).

Table 6
Cross-tabulation between Work Fatigue and Gender

Jenis Kelamin	Work Fatigue Category					
	Low (30-52)	Moderate (53-75)	High (76-98)	Very high (99-120)	Total	
					n	%
Male	58	10	2	0	70	98,6
Female	1	0	0	0	1	1,4
Total	59	10	2	0	71	100

Source: Primary Data, 2025

Table 6 shows that the majority of security guards are male, with the largest number falling into the low fatigue category, namely 59 security guards with a percentage of 83.1%. Seventy security guards with a percentage of 98.6% are male.

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Table 7
The Relationship between Worker Age and Work Fatigue among Security Personnel at PT. Pertamina Geothermal Energy, Lahendong Area

Variable	n	Correlation Coefficient	*p* value
The Relationship between Worker Age and Work Fatigue	71	0,057	0,640

Source: Primary Data, 2025

The relationship between worker age and work fatigue among workers at PT. Pertamina Geothermal Energy Area Lahendong, based on the results of bivariate data analysis using the Spearman Rank correlation test, yielded a p-value of 0.640 > 0.05 with a coefficient or r value of 0,057. Based on the above analysis, it can be concluded that there is no relationship between worker age and work fatigue at PT. Pertamina Geothermal Energy Area Lahendong.

Table 8
The Relationship between Worker Shifts and Work Fatigue among Security Personnel at PT. Pertamina Geothermal Energy, Lahendong Area

Variable	n	Correlation Coefficient	*p* value
The Relationship between Worker Shifts and Work Fatigue	71	0,082	0,496

Source: Primary Data, 2025

The relationship between work shifts and work fatigue among employees at PT. Pertamina Geothermal Energy Area Lahendong, based on the results of bivariate data analysis using Spearman's rank correlation test, yielded a r-value of 0.082 > 0.05 with a correlation coefficient or p-value of 0.496. The correlation in this analysis was negative, meaning that the higher the work shift, the lower the work fatigue score. Based on the above

analysis, it can be concluded that there is no relationship between work shifts and work fatigue at PT. Pertamina Geothermal Energy Area Lahendong.

DISCUSSION

The results of this study provide valuable insights into the relationship between worker age, shift work, and job fatigueamong security personnel at PT Pertamina Geothermal Energy Lahendong. Despite the significant concerns regarding fatigue in high-risk jobs, particularly those requiring shift work, the findings of this study suggest that age and shift workdo not have a significant direct relationship with job fatigue in this specific context.

Firstly, the analysis revealed no statistically significant correlation between age and job fatigue ($p = 0.640$). This finding contrasts with several studies that have found a direct relationship between older age and increased fatigue. For example, research by Paryanto et al. (2018) demonstrated that older workers tend to experience higher levels of fatigue due to physiological changes associated with aging, such as decreased muscle strength, reduced stamina, and slower recovery times. Similarly, Smith et al. (2020) found that older employees in demanding roles showed higher fatigue levels, which affected their overall performance. However, the findings of this study may differ because the security personnel in this research were relatively young on average, and their shift schedules may not have been as physically demanding as those in other industries, such as healthcare or manufacturing. Furthermore, the security role at PT Pertamina Geothermal Energy involves regular breaks, which could help mitigate fatigue levels in older workers.

On the other hand, the relationship between shift work and job fatigue showed a moderate correlation coefficient ($r = 0.496$), but the result was not statistically significant ($p = 0.082 > 0.05$). This indicates that shift work was not significantly associated with job

fatigue among security personnel at PT Pertamina Geothermal Energy Lahendong. Although previous studies have reported that night shifts may contribute to fatigue due to circadian rhythm disruption, the findings of this study did not demonstrate a statistically significant relationship. This suggests that other factors, such as workload and environmental conditions, may play a more important role in influencing work fatiguee. For instance, Suryadi and Regina reported that night shift workers are particularly susceptible to fatigue due to the disruption of circadian rhythms, which leads to reduced alertness and cognitive performance. Similarly, studies have shown that workers who rotate shifts, especially those who work late-night hours, often report greater mental and physical exhaustion compared to those on fixed daytime schedules (10,11). This study's findings further corroborate these observations, as the security personnel working night shifts at PT Pertamina Geothermal Energy Lahendong reported moderate fatigue levels. However, it is important to note that while a relationship exists, it is not as strong as expected, suggesting that other factors, such as workload and the physical demands of the environment, may also play a role.

One interesting aspect of this study is that age did not appear to strengthen the relationship between shift work and job fatigue. Previous studies, such as Harahpa (12), have suggested that older workers on night shifts experience higher levels of fatigue due to physiological decline and circadian rhythm disruption. However, this pattern was not clearly observed in the present study. This may be explained by the demographic characteristics of the sample, where most security personnel were relatively young and may have been more resilient to the effects of shift work (13).

In conclusion, while shift work remains a contributing factor to job fatigue, age does not appear to be a strong determinant among security personnel at PT Pertamina Geothermal Energy Lahendong. These findings highlight the importance of managing work schedules and ensuring adequate rest, especially for workers on rotating shifts. Future

research should explore other factors, such as physical fitness, job stress, and work environment, which may interact with age and shift work to influence fatigue levels.

CONCLUSIONS AND RECOMMENDATIONS

This study aimed to examine the relationship between worker age, shift work, and job fatigue among security personnel at PT Pertamina Geothermal Energy Lahendong. The findings revealed that there was no significant relationship between age and job fatigue, suggesting that age alone does not appear to be a major factor influencing fatigue levels in this context. In contrast, the study did find a moderate relationship between shift work and job fatigue, indicating that working irregular shifts, especially night shifts, contributes to higher levels of fatigue among security workers. These results underline the importance of considering shift schedules in managing fatigue in high-risk occupations. The study highlights that while age may not play a significant role, the nature of shift work especially night shifts remains a critical factor in job fatigue. Based on these findings, it is recommended that PT Pertamina Geothermal Energy Lahendong explore strategies for optimizing shift schedules and ensuring adequate rest periods for workers, particularly those on night shifts. Additionally, future research should examine other variables that might contribute to fatigue, such as workload, job stress, and the physical demands of security work. Expanding the scope of the study to include factors like physical health and environmental conditions could provide further insights into how these elements interact to affect fatigue levels. Overall, addressing shift work schedules and worker well-being should be a priority for improving performance and safety in the workplace.

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