BURNOUT AS A MEDIATOR OF TRAIN DRIVERS' PERFORMANCE IN WORK SHIFTS
STUDY AT PT KERETA API INDONESIA (PERSERO)

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Abstract

Safety and performance of train drivers are critical factors in railway operations. Shift work systems involving night shifts, irregular rotations, and long working hours may increase work-related fatigue (burnout), which in turn reduces driver performance. This study analyzes the effect of work shifts on train driver performance with burnout as a mediating variable at PT Kereta Api Indonesia (Persero). A quantitative approach was applied through a survey of 2,184 train drivers, and the data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The results show that work shifts have a significant positive effect on burnout (β = 0.608), while work shifts negatively affect train driver performance (β = –0.339). Burnout also demonstrates a very strong negative effect on performance (β = –0.839). Furthermore, burnout significantly mediates the relationship between work shifts and performance, accounting for a mediation effect of 51%. These findings indicate that performance decline is more strongly driven by burnout than by the direct impact of shift work. Compared with Indonesia, Japan's fatigue management practices through a Fatigue Risk Management System (FRMS) are more systematic and preventive. This research strengthens the role of burnout within the Job Demands–Resources framework and provides practical implications for PT KAI in improving shift work policies to enhance safety.

Keywords: *Work Shift, Burnout, Job Performance*

INTRODUCTION

Railway transportation is a public transport mode with a high level of safety risk, making it highly dependent on the optimal performance of human resources, especially train drivers. Train drivers are required to maintain alertness, concentration, and precise decision-making in complex and dynamic working conditions. In this operational context, shift work becomes an inevitable necessity, yet it also has the potential to negatively impact the physical and psychological well-being of workers.

Shift work, particularly involving night duties and irregular schedules, has been shown to disrupt circadian rhythms, reduce sleep quality, and increase fatigue and diminished work motivation (Fan &

Smith, 2018; Dorrian et al., 2007). This leads to increased risks of fatigue and burnout, ultimately affecting safety, alertness, and the performance of train drivers (Lupșa & Virga, 2020).

From a theoretical perspective, the Job Demands–Resources (JD-R) Theory explains that high job demands, such as shift work, can drain workers' energy resources and trigger burnout if not balanced with adequate recovery resources (Cheng et al., 2023; Gu et al., 2023). Burnout, characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach & Jackson, 1981), can further lead to a decline in individual performance.

Various empirical studies indicate that the impact of shift work on performance is not always direct; it is often mediated by the worker's psychological condition. Decreased sleep quality and increased burnout have been shown to negatively affect productivity, increase work errors, and weaken commitment to safety (Wisetborisut et al., 2014; Portero et al., 2020; Gomes et al., 2022). However, empirical research specifically positioning burnout as a mediating variable in the context of railway train drivers in Indonesia remains limited.

On the other hand, fatigue management practices for train drivers in Japan demonstrate a systematic and preventive approach through shift scheduling that takes biological rhythms and fatigue limits into account (Fan & Smith, 2018). This comparison is relevant for enriching the understanding of the importance of safety-based shift management.

Based on this background, this research aims to analyze the impact of work shifts on burnout, the impact of work shifts on train driver performance, the impact of burnout on train driver performance, and the role of burnout as a mediator in the relationship between work shifts and train driver performance at PT Kereta Api Indonesia (Persero).

Work Shift and Burnout

Shift work has long been identified as a job demand that can potentially cause physiological and psychological disturbances. Night shifts and irregular schedule rotations have been shown to disrupt circadian rhythms and workers' sleep quality (Akerstedt, 2003; Folkard & Tucker, 2003). In high-risk occupational contexts, these conditions increase fatigue and the risk of burnout (Caruso, 2014; Leso et al., 2021).

Within the Job Demands–Resources (JD-R) framework, shift work is positioned as a job demand that drains both physical and mental energy (Demerouti et al., 2001; Bakker & Demerouti, 2017). When these demands are chronic and not balanced with adequate recovery, individuals become susceptible to burnout (Bakker et al., 2014; Cheng et al., 2023; Gu et al., 2023). Studies in the railway context have shown that fatigue from shift work directly affects train drivers and railway staff (Dorrian et al., 2007; Fan & Smith, 2018).

Work Shift and Job Performance

Job performance reflects an individual's level of achievement in performing tasks according to organizational standards (Koopmans et al., 2014). Several studies have shown that shift work and long working hours are negatively correlated with job performance due to reduced alertness and cognitive functioning (Williamson et al., 2011; Caldwell et al., 2019). In the transportation and safety sectors, performance decline due to fatigue has direct implications for accident risks (China State Railway Group, 2020; Japan Transport Safety Board, 2019).

Empirical research across various sectors indicates that shift work significantly impacts individual performance, both directly and through fatigue mechanisms (Eurofound, 2017; Albishri & Zamzami, 2021).

Burnout and Job Performance

Burnout is a psychological syndrome characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach & Jackson, 1981; Maslach et al., 2001). Burnout has consistently been shown to have a negative relationship with job performance across various work contexts (Demerouti et al., 2014; Wu et al., 2019).

Several empirical studies indicate that individuals with high levels of burnout tend to experience decreased productivity, increased work errors, and weakened job commitment (Al-Badarneh et al., 2019; Gomes et

al., 2022; Lei et al., 2024). In the context of public service and safety occupations, burnout becomes a critical factor that diminishes performance quality (González-Rico et al., 2022).

Burnout as a Mediating Variable

Various studies have demonstrated that burnout acts as a psychological mechanism bridging the impact of job demands on individual performance. Burnout has been shown to mediate the relationship between job demands and individual performance in sectors such as healthcare, public service, and high-risk organizations (Lupșa & Virga, 2020; Lim et al., 2022; Alshammari et al., 2025). These findings indicate that the impact of job demands on performance is largely mediated by work-related fatigue.

Referring to these empirical findings, this research tests burnout as a mediating variable in the relationship between work shifts and train driver performance at PT Kereta Api Indonesia (Persero).

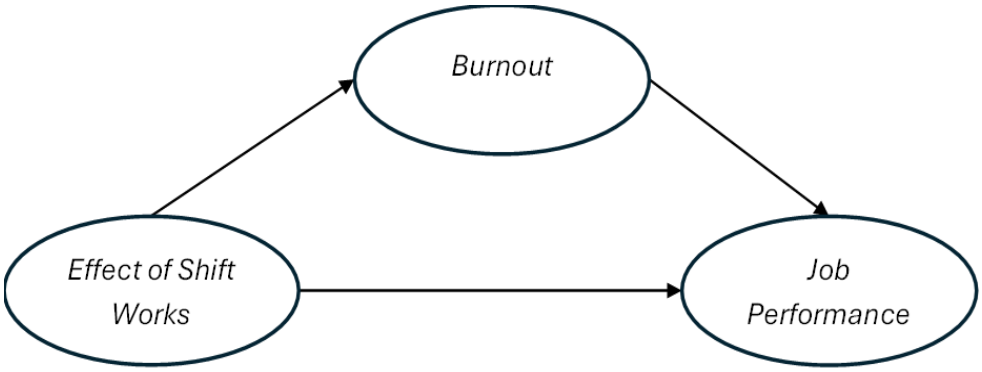
Based on this explanation, the research hypotheses are formulated as follows:

a. H1: Work shift has a positive effect on burnout.
b. H2: Work shift has a negative effect on train driver performance.
c. H3: Burnout has a negative effect on train driver performance.
d. H4: Burnout mediates the effect of work shift on train driver performance.

Research Model

Based on the hypothesis development, this research model positions work shift as the independent variable, burnout as the mediating variable, and job performance as the dependent variable.

Figure 1. Research Model



METHOD

This study employs a quantitative approach using a survey method to identify and analyze the extent to which Work Shift and Burnout affect the Job Performance of Railway Rolling Stock Personnel (ASP) at PT Kereta Api Indonesia (Persero). The research design is causal, aiming to explain the cause-and-effect relationships between variables through the testing of formulated hypotheses.

The study population consists of all train drivers at PT Kereta Api Indonesia (Persero), with a total of 2,184 respondents. Data is collected using a structured questionnaire that measures the variables of work shift, burnout, and job performance. The research is conducted over the period from January to June 2025, encompassing data collection, identification, and analysis phases.

The research instrument is a closed-ended questionnaire consisting of 40 items using a Likert scale from 1 to 4 (1 = strongly disagree, 4 = strongly agree), covering four main variables: job demands, job resources, well-being, and performance. The Likert scale is used to measure respondents' perceptions and attitudes toward social phenomena in a quantifiable manner (Sekaran & Bougie, 2016).

The collected data is then analyzed using Structural Equation Modeling (SEM) based on Partial Least Squares (PLS) with the help of SmartPLS software. The analysis involves two main stages: the measurement model (outer model) to test the validity and reliability of the instruments, and the structural model (inner model) to examine the relationships between latent variables and the research hypotheses (Hair et al., 2019).

Validity is tested through convergent validity and discriminant validity. Indicators are considered valid if they have a loading factor greater than 0.70 and an Average Variance Extracted (AVE) greater than 0.50. Reliability is assessed using Cronbach's Alpha and Composite Reliability, with a minimum threshold of 0.70. The structural model testing involves evaluating R^2, f^2, Q^2, and the Standardized Root Mean Square Residual (SRMR) to ensure the model's goodness of fit. Hypothesis testing is conducted by examining the t-statistic (greater than 1.96) and the p-value (less than 0.05) at a 5% significance level.

This method is chosen because it can simultaneously analyze complex relationships between variables and provide a comprehensive overview of the impact of job demands, job resources, and well-being on the performance of Railway Rolling Stock Personnel at PT Kereta Api Indonesia (Persero).

RESULTS

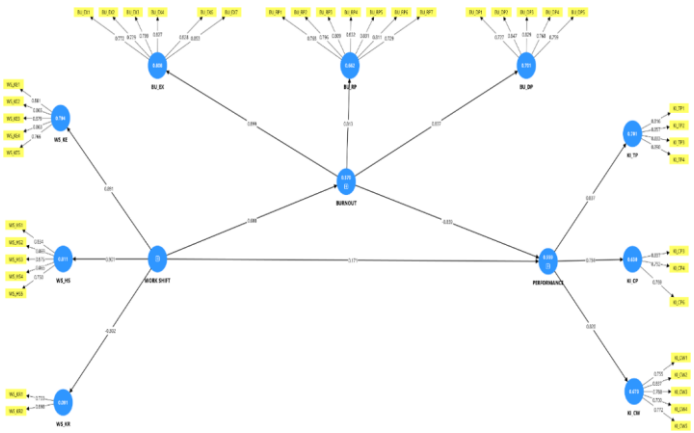
This study involved 2,184 train drivers at PT Kereta Api Indonesia (Persero), most of whom are in their productive age and have mid-level work experience, with a predominance of Junior Train Drivers who are directly exposed to shift work patterns. This characteristic indicates a high intensity of job demands and irregular working hours, which can potentially increase burnout, particularly emotional exhaustion. Although the respondents have adequate operational experience, the accumulation of workload due to shift work poses a risk to the consistency and quality of job performance, making it relevant to examine the causal relationships among these variables. Data analysis was conducted using Structural Equation Modeling–Partial Least Squares (SEM-PLS).

Outer Model Testing

At this stage, instrument testing is performed to ensure that the measurement tools used in this study are valid and reliable. In this research, both tests are conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach by confirming the measurement model (outer model). This model aims to ensure that the indicators accurately reflect the latent constructs being measured. The constructs tested in this study include Work Shift, Burnout, and Job Performance.

Testing is carried out using a second-order measurement model (multidimensional constructs) through SmartPLS version 4, as shown in Figure 2. According to Hair et al. (2019), second-order measurement is used when a construct has multiple dimensions, each measured by several indicators. This approach allows researchers to comprehensively analyze the relationships among dimensions within complex constructs.

Figure 2
Second Order Measurement Model



The evaluation of the outer model is performed to test the validity and reliability of the indicators. If any indicator's factor loading is below 0.7, it is removed from the model. After data reduction, the analysis results presented in Table 1 show that all indicators have factor loadings above 0.7 and that the Average Variance Extracted (AVE) for each sub-construct is above 0.5, indicating that the indicators are convergently valid. Thus, it can be concluded that the manifest variables are strongly correlated with their latent constructs.

Table 1. Factor Loading and Average Variance Extracted (AVE)

Variabel	AVE	No Indicator	Indicator	Factor Loading
Work Shift	*Health Effects 0,891*	WS_KE1	I experience more health issues when working night shifts.	0,881
		WS_KE2	I feel more stressed when working night shifts.	0,865
		WS_KE3	I have sleep problems when working night shifts.	0,879
		WS_KE4	I feel tired after midnight when working night shifts.	0,863
		WS_KE5	I feel sleepier after working night shifts.	0,766
	Social Effects 0,901	WS_HS1	I have poor social relationships because of shift work.	0,834
		WS_HS2	Night shifts cause conflicts with my family.	0,869
		WS_HS3	Night shifts negatively impact my family relationships.	0,875
		WS_HS4	Because of shift work, I cannot maintain social relationships.	0,865
		WS_HS5	Night shift work results in spending less time with my family.	0,750
	Career Quality -0,302	WS_KR1	My work quality on night shifts is not different from that on day shifts.	0,733
		WS_KR2	Working night shifts gives me opportunities to improve performance and advance my career.	0,898
Burnout	*Emotional Exhaustion* 0,899	BU_EX1	I feel emotionally drained because of my job.	0,772
		BU_EX2	I feel tired when I wake up in the morning and have to face another workday.	0,729
		BU_EX3	Working with colleagues all day is really a burden for me.	0,799
		BU_EX4	I feel frustrated with my job.	0,827
		BU_EX6	Working directly with people puts too much pressure on me.	0,828
		BU_EX7	I feel like I have run out of patience at work.	0,853
	Reduced Personal Accomplishmet 0,813	BU_RP1	I can easily understand my work. *	0,768
		BU_RP2	I handle my work problems very effectively. *	0,796
		BU_RP3	I feel that I positively influence other people's lives through my work. *	0,809
		BU_RP4	I feel very energetic. *	0,832
		BU_RP5	I can easily create a relaxed atmosphere with my colleagues at work. *	0,831
		BU_RP6	I have accomplished many worthwhile things in this job. *	0,811
		BU_RP7	In my work, I deal with emotional problems	0,729

			very calmly. *	
	Depersonalization 0,837	BU_DP1	I feel that I treat some colleagues as if they were just strangers.	0,727
		BU_DP2	I have become more insensitive toward colleagues since I started this job.	0,847
		BU_DP3	I worry that this job is making me emotionally harder.	0,829
		BU_DP4	I really do not care much about what happens to some of my colleagues.	0,768
		BU_DP5	I feel that some colleagues blame me for their problems.	0,759
Job Performance	*Task Performance* 0,837	KI_TP1	I operate the train to ensure it arrives according to the predetermined schedule	0,816
		KI_TP2	I remain focused on safety and smooth operations throughout the train journey.	0,857
		KI_TP3	I am able to distinguish critical situations from minor disturbances while operating the train.	0,833
		KI_TP4	I operate the train smoothly, efficiently, in accordance with procedures, and effectively.	0,890
	Contextual Performance 0,794	KI_CP3	I try to keep my job knowledge up to date.	0,837
		KI_CP4	I find creative solutions to new problems in my work.	0,792
		KI_CP6	I actively participate in work-related discussions.	0,769
	Counterproductive Work Behavior (CWB) 0,820	KI_CW1	I often complain about trivial matters at work. *	0,755
		KI_CW2	I tend to exaggerate problems while working. *	0,837
		KI_CW3	I focus more on negative aspects than positive aspects of a work situation. *	0,788
		KI_CW4	I talk to colleagues about the negative side of my job. *	0,700
		KI_CW5	I talk to people outside the company about the negative side of my job. *	0,772

**Reverse code*

The second stage involves testing reliability to ensure that each construct in the model has good internal consistency and is reliable for measurement. Using the SEM-PLS approach, reliability is evaluated through Cronbach's Alpha and Composite Reliability (CR). According to Hair et al. (2019), an acceptable reliability threshold is ≥ 0.70, indicating that the indicators consistently measure the same variable.

Table 2. Cronbach's alpha and Composite reliability

Variabel	Cronbach's alpha	Composite reliability
Work Shift	0,852	0,918
Burnout	0,931	0,934
Job Performance	0,873	0,892

Based on Table 2, all constructs have Cronbach's Alpha and Composite Reliability values above 0.70, indicating excellent reliability. This means that each construct has strong internal consistency, making the instruments reliable and stable for further structural model analysis.

Table 3. R Square

Variable	*R Square*	Strength of Relationship
Job Performance	0,873	Strong

In the inner model, the R-square (R^2) value of 0.873 for Job Performance indicates a strong explanatory power (Hair dkk., 2019). Meaning that the predictor variables in the work shift model explain 87.3% of the variation in job performance, with the remaining 12.7% influenced by other factors outside the model.

Next, the effect size (f^2) was examined to determine the magnitude of the influence of each predictor variable on the dependent variable. According to the guidelines proposed by Hair et al. (2019), effect size values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively, for the direct impact of an exogenous construct on an endogenous construct (Hair et al., 2019).

Table 4. Effect size (f^2)

Predictor Variable	*Effect size* (f^2)	Strength of Relationship
Work Shift	0,171	Medium
Burnout	0,839	Large

As presented in Table 4, the effect size (f^2) results indicate that work shift has an f^2 value of 0.171, which falls into the medium effect category. This suggests that shift work contributes a moderate influence on job performance. Although the effect is not dominant, effective shift scheduling and management may still play an important role in supporting and improving train driver performance.

Furthermore, Table 4 shows that burnout has an f^2 value of 0.839, which is classified as a large effect. This substantial negative effect demonstrates that burnout exerts a very strong detrimental impact on job performance. The higher the level of burnout experienced by train drivers, the lower their work performance. This finding highlight burnout as a critical factor that must be minimized to maintain productivity and operational safety.

Therefore, it can be concluded that burnout is the most significant determinant contributing to the decline in train driver job performance. Consequently, organizations should prioritize stress management and burnout prevention strategies, alongside the implementation of optimal shift work arrangements.

Structural Model Evaluation

The structural model evaluation was conducted to assess the strength and direction of the causal relationships among the variables in the proposed research model. The results indicate that all structural paths produced T-statistic values above the critical threshold and p-values below 0.05, suggesting that the model has strong explanatory power and that all research hypotheses are empirically supported.

Effect of Work Shift on Burnout

The analysis reveals that work shift has a positive and significant effect on burnout ($\beta = 0.608$; $T = 30.693$; $p < 0.001$). This coefficient indicates that the greater the intensity and complexity of shift work experienced by train drivers, the higher the level of burnout they report. The magnitude of the path coefficient suggests that shift work is a major determinant of occupational fatigue and burnout among locomotive engineers.

Effect of Work Shift on Job Performance

The direct path testing shows that work shift has a significant negative effect on job performance ($\beta = -0.339$; $T = 12.165$; $p < 0.001$). This finding implies that poorly managed shift work schedules directly reduce train driver performance, particularly in terms of performance consistency and work vigilance.

Effect of Burnout on Job Performance

The results further demonstrate that burnout exerts a very strong negative effect on job performance ($\beta = -0.839$; $T = 44.486$; $p < 0.001$). This high coefficient confirms that burnout is the dominant factor explaining variations in train driver performance decline, exceeding the direct impact of shift work itself.

Mediation Effect of Burnout

The mediation analysis indicates that burnout significantly mediates the relationship between work shift and job performance, with an indirect effect value of –0.510 ($T = 22.235$; $p < 0.001$). These results suggest that more than half of the impact of shift work on train driver performance is transmitted through the mechanism of occupational fatigue and burnout. Therefore, burnout serves as a substantial partial mediator within the proposed research model.

Table 5. Results of the Variable Relationship Testing

	Relationship	Path Coefficient (O)	T Statistic	P-Value	Impact (%)	Result
1	*Work Shift-> Burnout*	0,608	30,693	0,000	60,8 %	Significant positive effect
2	*Work Shift -> Job Performance*	-0,339	12,165	0,000	33,9 %	Significant negative effect
3	*Burnout -> Job Performance*	-0,839	44,486	0,000	83,9 %	Significant negative effect
5	*Work Shift ->Burnout -> Job Performance*	-0,510	22,235	0,000	51%	Significant negative indirect effect

DISCUSSION

The findings of this study demonstrate that work shift significantly contributes to increased burnout among train drivers. This result reinforces the role of shift work as a major job demand that depletes both the physical and psychological energy of locomotive engineers. Within the operational context of PT Kereta Api Indonesia (Persero), the nature of train driving—characterized by long duty hours, long-distance routes, and alternating day–night schedules—further amplifies the risk of occupational fatigue and burnout.

Moreover, burnout was found to have a very strong negative effect on train driver job performance. This confirms that occupational fatigue is not merely a matter of employee well-being, but also a critical determinant of performance and operational safety. Reduced vigilance and concentration caused by burnout may increase the likelihood of human error, which is particularly dangerous in high-risk occupations such as train driving.

The mediation analysis further indicates that burnout serves as a partial mediator in the relationship between work shift and job performance. This suggests that the adverse effect of shift work on performance occurs largely through the psychological mechanism of fatigue and burnout. These findings provide strong empirical support for the Job Demands–Resources (JD-R) Theory in explaining how high job demands lead to psychological strain, which subsequently undermines employee performance.

Comparatively, the management of train driver shift work in Japan reflects a more proactive approach through the implementation of a Fatigue Risk Management System (FRMS). This system treats fatigue as an operational safety risk and addresses it through limits on working hours, minimum rest intervals, and more stable shift rotation patterns. In contrast, the results of this study indicate that shift work management at PT KAI remains relatively reactive, where the negative consequences of shift work tend to be recognized only after burnout and performance deterioration have already occurred.

CONCLUSION

This study concludes that work shift has a significant effect on both burnout and train driver job performance, and that burnout plays a major mediating role in this relationship. The decline in train driver performance is more strongly explained through the mechanism of occupational fatigue and burnout rather than through the direct impact of shift work alone.

The practical implication of this research highlights the urgent need for PT Kereta Api Indonesia (Persero) to reform its shift work policies by integrating fatigue management as a core component of the railway safety system. Strengthening fatigue risk management programs, restructuring shift rotation schedules, and providing structured recovery mechanisms are strategic measures to reduce burnout and enhance train driver performance.

RECOMMENDATIONS FOR DEVELOPMENT

Future studies should expand the research scope beyond one operational unit of train drivers at PT KAI to improve the generalizability of findings. To reduce bias from self-report measures, researchers are encouraged to integrate objective indicators such as safety records and supervisor evaluations. Longitudinal designs are also recommended to capture the dynamic impact of shift work on burnout and performance over time. Additionally, work shift characteristics should be assessed more specifically, including night-duty frequency, duty duration, rotation patterns, and overtime intensity. Further research may incorporate additional Job Demands–Resources factors such as organizational support, job control, and recovery quality. Practically, PT KAI should strengthen fatigue risk management through improved shift scheduling, adequate rest intervals, and systematic burnout prevention as part of its railway safety management strategy.

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