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The Relationship of Knowledge and Supervision Towards PPE Using the Behaviour of Technicians in Building

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ABSTRACT

The high incidence of injuries and near misses at Building X in the past year indicates low compliance with the use of Personal Protective Equipment (PPE). This study aims to analyse the relationship between knowledge and supervision on PPE usage behaviour among technicians. This quantitative study employed a cross-sectional design with 37 respondents. Data were collected through questionnaires and observations, and analysed using the chi-square test. The results showed a significant relationship between knowledge (p = 0.000) and supervision (p = 0.000) with PPE usage behaviour. Respondents with low knowledge tended to engage in risky behaviour (95%), while poor supervision was also associated with risky behavior (93.8%). In conclusion, knowledge and supervision play a crucial role in shaping safe work behaviour. It is recommended that companies enhance PPE SOP socialisation, conduct regular training, strengthen daily monitoring systems, and enforce sanctions for violations to reduce the risk of workplace accidents.

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1. INTRODUCTION

Office occupational safety and health (OSH) prevents work-related injuries during employees' daily activities (Permenkes, 2016). Unlike industrial environments often associated with heavy machinery and hazardous chemicals, offices are frequently perceived as low-risk workplaces. However, this perception can be misleading. Office environments are also prone to chemical, biological, physical, ergonomic, and psychosocial hazards, which may cause significant harm if not properly managed. Building managers, therefore, have a fundamental responsibility to identify, control, and mitigate these hazards and maintain the safety and health of all workers. Among the most common office-related injuries are slips, trips, and falls from heights. These can occur during window cleaning, rooftop maintenance, or repair work in elevated spaces (Permenkes, 2016). These hazards become even more pronounced during maintenance work that involves specialised tools, exposure to electrical components, or work in confined spaces.

On a global scale, the magnitude of occupational hazards is alarming. The International Labour Organisation (ILO) reported in 2023 that work-related injuries rank as the third leading cause of death worldwide, accounting for more than 363,000 fatalities annually. In Indonesia, the Social Security Agency for Employment (BPJS Ketenagakerjaan) recorded 360,635 work accidents in 2023 alone, with 21,034 cases occurring in DKI Jakarta. While many of these incidents were industrial, several serious accidents in office building settings involved

maintenance work at high altitudes, underscoring the critical need for stringent personal protective equipment (PPE) compliance.

Understanding why accidents happen is essential. Heinrich's Domino Theory offers a helpful framework, explaining that accidents occur through a sequence of interrelated factors: weak management control, root causes, direct causes (unsafe acts and unsafe conditions), the incident itself, and the resulting loss (Othman et al., 2018; Izral, 2016). Salim (2018) states that unsafe acts account for 88 per cent of workplace accidents, while unsafe conditions contribute 10 per cent. Unsafe acts may include failure to wear PPE, improper use of PPE, bypassing safety devices, or ignoring safety protocols (Larasatie, 2022; Misnuria, 2020).

Previous research on the determinants of unsafe acts has produced mixed findings. Larasatie (2022) reported that knowledge and supervision significantly impacted unsafe acts, attributing these behaviours to inadequate OSH socialisation and weak supervisory practices. Amalia (2021), however, found no significant correlation between knowledge and hazardous acts, though supervision still emerged as an essential factor. Meanwhile, Ramadhany & Pristya (2019) concluded that low OSH knowledge increases unsafe acts, and that poor supervision often results from a lack of PPE checks or inconsistent enforcement of SOPs.

A notable limitation of the existing literature is that most studies have concentrated on industrial work environments, neglecting high-risk activities in office maintenance. This is a significant gap, particularly because maintenance staff in office buildings—such as technicians working under shift systems—face unique challenges that may reduce alertness, increase fatigue, and lead to non-compliance with PPE requirements.

The present study addresses this research gap by focusing on building technicians who perform high-risk maintenance tasks in office environments. Based on data from Hazard Identification, Risk Assessment, and Determining Control (HIRADC) and accident investigation reports, all recorded near misses and lost workday cases in the past year were associated with PPE non-compliance. Interestingly, preliminary observations revealed that most technicians already understand PPE requirements, yet unsafe acts still occur. The persistence of these behaviours is linked to weak supervision, infrequent safety briefings, lack of sanctions for violations, and the absence of reward or recognition systems for compliance (Gultom et al., 2025; Ginza & Sukwika, 2024).

Given this context, the study aims to analyse the relationship between knowledge and supervision with PPE usage behaviour among building technicians. By identifying which factors most strongly influence compliance, this research seeks to provide evidence-based recommendations for targeted interventions in the office building maintenance sector. Ultimately, the findings are expected to support the development of more effective safety management strategies, enhance supervisory practices, and strengthen the safety culture in non-industrial yet high-risk workplaces.

2. RESEARCH METHOD

2.1. Sampling Technique

This study employed a total sampling technique because the total population of technicians at Building X consisted of only 37 individuals. Using this approach, all members of the population were included as research respondents to avoid bias and ensure that the results accurately represent actual conditions. The inclusion criteria were as follows: (1) having worked as a technician at Building X for at least six months, (2) willingness to participate as a respondent, and (3) presence during the data collection process.

2.2. Data Collection Technique

Data collection in this study was carried out through two primary methods: structured questionnaires and direct observation. The structured questionnaire was used to measure two independent variables, namely knowledge and supervision perception. The knowledge variable was assessed through multiple-choice

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questions covering the types, functions, and regulations on the use of personal protective equipment (PPE), while the supervision perception variable was measured through Likert-scale statements designed to assess the extent to which respondents perceived the presence of supervision in PPE usage. In addition, direct observation was conducted to assess the dependent variable, namely, PPE usage behavior by respondents while performing their tasks. This observation used a checklist developed based on the company's standard operating procedures (SOP) for PPE usage. Through this method, the researcher was able to obtain actual behavioural data in the field, thereby reducing bias that may arise when relying solely on questionnaire responses.

2.3. Data Analysis Technique

Data analysis in this study was conducted in two main stages: univariate analysis and bivariate analysis. Univariate analysis was used to describe the frequency distribution and percentages for each research variable. The variables analysed included PPE usage behaviour (categorised as risky or non-risky), knowledge level (high or low), and supervision quality (good or poor). This analysis aimed to provide a general overview of respondents' characteristics and the distribution of the research data. Subsequently, bivariate analysis was used to examine the relationship between the independent variables and the dependent variable. The relationships tested included the association between knowledge and PPE usage behaviour, as well as the association between supervision and PPE usage behaviour. The significance level was set at $\alpha = 0.05$ to determine the statistical significance of the results. Interpretation of the results was carried out by comparing the obtained p-value with the predetermined significance threshold. The results were considered statistically significant if the p-value < 0.05, indicating a meaningful relationship between the independent and dependent variables. Thus, the findings of this analysis can be used to conclude the factors influencing PPE usage behaviour among technicians at the study site.

3. RESULTS AND DISCUSSIONS

3.1. Result

Table 1 presents the frequency distribution of the study variables: PPE usage behaviour, knowledge, and supervision among 37 technicians in Building X. The results show that more than half of the respondents (54.1%) exhibited risky behaviour in using PPE, while 45.9% demonstrated non-risky behaviour. This finding indicates that unsafe practices in PPE usage remain prevalent and may increase the risk of work-related injuries. In terms of knowledge, 54.1% of technicians were categorised as having low knowledge about PPE, while 45.9% had high knowledge. This relatively balanced yet concerning distribution suggests that a substantial proportion of workers lack adequate understanding of PPE types, functions, and usage regulations, which could directly affect compliance.

Table 1. Results of Research Frequency Distribution

No.	Variable Name	f	%
1.	**Behaviour**		
	Risk	20	54.1
	No Risk	17	45.9
2.	**Knowledge**		
	Low	20	54.1
	High	17	45.9
3.	**Supervision**		
	Bad	16	43.2
	Good	21	56.8
	TOTAL	**37**	**100.0**

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Regarding supervision, 43.2 per cent of respondents perceived supervision as poor, while the majority (56.8 per cent) rated it as good. Although more than half reported good supervision, the persistence of risky PPE behaviour suggests that supervision may not be consistent or effectively enforced. Overall, these findings highlight that both knowledge deficits and variations in supervision quality potentially contribute to risky PPE usage behaviour. Targeted interventions, such as regular safety training and stricter monitoring, are essential to improve compliance and enhance workplace safety in Building X.

Table 2 illustrates the relationship between knowledge level and PPE usage behaviour among 37 technicians in Building X. The findings reveal a clear association between these two variables. Among respondents with low knowledge, 95.0 per cent demonstrated risky PPE usage behaviour, while only 5.0 per cent exhibited non-risky behavior. In contrast, among those with high knowledge, 94.1 per cent practised safe PPE usage, and only 5.9% engaged in risky behaviour.

The statistical analysis using the Chi-Square test produced a p-value of 0.000, which is significantly lower than the α value of 0.05. This indicates a statistically significant relationship between knowledge and PPE usage behaviour. In other words, technicians with higher levels of knowledge about PPE tend to comply with safe usage practices, whereas those with lower knowledge are more likely to engage in unsafe acts.

Table 2. The Relationship Between Knowledge and Behaviour of Using PPE Among Technicians

Knowledge	PPE Usage Behaviour		Total	P
	Risk	Not At Risk		
Low	19 (95.0%)	1 (5.0%)	20 (100%)	0.000
High	1 (5.9%)	16 (94.1%)	17 (100%)	
Total	20 (54.1%)	17 (45.9%)	37 (100%)	

These results suggest that knowledge is a critical factor influencing PPE compliance. Inadequate understanding of PPE types, functions, and proper usage procedures increases the likelihood of risky behaviour, potentially elevating workplace accident risks. Therefore, to improve compliance and enhance safety culture, management needs to implement regular PPE training sessions, continuous safety briefings, and comprehensive dissemination of PPE standard operating procedures (SOPs).

Table 3 presents the relationship between supervision quality and PPE usage behaviour among 37 technicians in Building X. The results indicate that poor supervision is strongly associated with risky PPE behaviour. Specifically, among respondents who perceived supervision as bad, 93.8% engaged in risky PPE usage, while only 6.3% exhibited safe behaviour. Conversely, among those who perceived supervision as good, 76.2% practiced safe PPE usage, and only 23.8% displayed risky behaviour.

Table 3. Relationship between Supervision and the Behaviour of Using PPE among Technicians

Supervision	PPE Usage Behaviour		Total	P
	Risk	Not At Risk		
Bad	15 (93.8%)	1 (6.3%)	16 (100%)	0.000
Good	5 (23.8%)	16 (76.2%)	21 (100%)	
Total	20 (54.1%)	17 (45.9%)	37 (100%)	

The Chi-Square test yielded a p-value of 0.000, which is significantly lower than the α value of 0.05. This confirms a statistically significant relationship between supervision quality and PPE usage behaviour. These findings suggest that effective and consistent supervision plays a crucial role in promoting compliance with PPE usage.

Inadequate supervision may result in workers disregarding safety protocols, either due to a lack of reminders, the absence of sanctions, or weak enforcement of standard operating procedures (SOPs). On the other hand, good supervision — characterised by regular monitoring, prompt corrective actions, and enforcement of safety rules — encourages technicians to adhere to PPE standards. Therefore, strengthening supervisory practices, increasing inspection frequency, and applying consistent sanctions for violations are essential steps to improve PPE compliance and reduce occupational risks in Building X.

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3.2 Discussion

3.2.1. Univariate Analysis

Behaviour of Using Personal Protective Equipment in Technicians. A study of 37 technicians at Building X showed that the number of workers not using PPE was higher than the number who used it. Observations revealed that the most frequently neglected PPE items were safety helmets, gloves, and protective glasses. Some workers operated grinders without gloves, goggles, or protective clothing, while others repaired live electrical lamps without wearing electrical gloves. Unsafe actions are behaviours that violate work standards and have the potential to cause injury (Larasatie, 2022). Common unsafe actions include not wearing PPE, using inappropriate PPE, removing footwear or protective clothing, and ignoring safety procedures (Misnuria et al., 2020).

Technician's Knowledge of Applicable Standard Operating Procedures. The questionnaire results showed that many workers answered incorrectly regarding the type of head protection according to SOPs, as well as the rules for imposing sanctions and issuing warning letters. PPE SOP socialisation was conducted only once and did not reach all workers due to the shift work system. Knowledge is an essential first step to ensure compliance with PPE usage. Workers must understand the risks, hazards, and the correct type of PPE for specific situations (Verbeek et al., 2020).

Technicians' Perceptions of Applicable Monitoring of PPE Use. Observations indicated that when unsupervised, workers tended not to use PPE according to SOPs. HSE supervision was not optimal; briefings were held only once a month, inspections were inconsistent due to limited personnel, and the technicians' work scope was extensive. Sanctions were not applied consistently; HSE only issued verbal warnings, while written warnings stipulated in the SOP were not enforced. Supervision should ensure compliance with regulations and guide to guarantee their successful implementation (Edigan et al., 2019).

3.2.2. Bivariate Analysis

The Relationship between Knowledge and PPE Use Behaviour. This study confirmed a significant relationship between knowledge and PPE usage behaviour among technicians in Building X. This finding is consistent with Ghassani (2023), who reported a *p*-value of 0.029 (<0.05). Some workers with low knowledge still exhibited unsafe behaviours, such as not using complete PPE. According to Skinner in Notoatmodjo (2020), behaviour is an individual's response to environmental stimuli. Regular SOP socialisation can shape safe behaviour. Field observations showed many workers did not use appropriate PPE when working with mechanical tools or electrical installations. PPE SOP socialisation had only been conducted once since implementation, and not all technicians participated due to differing shift schedules.

The Relationship between Supervision and PPE Use Behaviour. The results indicated a significant relationship between supervision and PPE usage behaviour ($p = 0.000$). This aligns with Tho et al. (2019) and Ghassani et al. (2023), who found that good supervision positively impacts PPE compliance because workers tend to fear sanctions. Conversely, Muafi & Situngkir (2022) found no relationship, as compliance occurred only during active supervision. Supervisors play a vital role in ensuring safety objectives are met. Observations showed that HSE supervision at Building X was ineffective; briefings were held only monthly, sanctions were not applied according to SOPs, and routine inspections were absent. Improvements are needed in daily supervision, PPE suitability checks, and consistent enforcement of sanctions for workers engaging in risky behaviours.

CONCLUSION

The findings of this study indicate that both knowledge and supervision have a significant relationship with PPE usage behaviour among technicians in Building X. Technicians with low knowledge are more likely to engage in risky PPE usage, while those with high knowledge tend to comply with safety standards. Similarly,

poor supervision is strongly associated with unsafe PPE practices, whereas good supervision promotes compliance. These results highlight that inadequate knowledge dissemination and weak enforcement of safety rules contribute to the persistence of unsafe acts, increasing the potential for workplace accidents. Therefore, improving both knowledge and supervision is critical to fostering a stronger safety culture and reducing occupational risks in the building maintenance environment.

To improve PPE compliance, it is recommended that management implement regular and comprehensive PPE training sessions, ensuring that all technicians understand the types, functions, and correct usage of PPE as outlined in the SOPs. Safety briefings should be conducted more frequently, with materials adapted to the technicians' shift schedules. Additionally, supervision should be intensified through daily inspections, the use of compliance checklists, and consistent enforcement of sanctions for non-compliance. A reward and recognition system can also be introduced to encourage adherence to safety protocols. By combining education, monitoring, and motivation, the organisation can significantly enhance PPE usage behaviour and minimize the risk of workplace incidents.

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