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THE EFFECT OF THE AVAILABILITY OF PERSONAL PROTECTIVE EQUIPMENT (PPE) AND WORKPLACE SUPERVISION ON OCCUPATIONAL HEALTH AND SAFETY (OHS) AMONGST FIRE SERVICE PERSONNEL IN THE CITY OF SERANG

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Abstract

This study aims to analyze the simultaneous influence of Personal Protective Equipment (PPE) availability and workplace supervision on Occupational Safety and Health (OSH). A quantitative approach with a survey design was employed to examine the relationship between these variables. The study involved respondents selected using a saturation sampling technique, in which all members of the relevant population were included as participants. Data were collected through a structured questionnaire designed to obtain information regarding the availability and use of PPE, workplace supervision, and the implementation of OSH practices. The collected data were processed and analyzed using the Statistical Package for the Social Sciences (SPSS) version 29. The results indicate that both PPE availability and workplace supervision have a positive influence on OSH. These findings suggest that adequate PPE provision, supported by consistent and effective workplace supervision, plays an important role in strengthening occupational safety practices. Therefore, organizations should ensure the availability of appropriate PPE and improve workplace supervision as part of their efforts to create a safer, healthier, and more supportive working environment for employees.

Keywords: Availability of Personal Protective Equipment (PPE), Work Supervision, Occupational Safety and Health (OSH), Firefighters.

INTRODUCTION

Management, by its very nature, is the process of planning, organizing, directing and controlling an organization's resources to achieve objectives effectively and efficiently. Within the scope of Human Resource Management (HRM), the primary focus is on the management of employees, ranging from recruitment, training and development to the maintenance of harmonious industrial relations. One of the most crucial aspects of this management is Occupational Safety and Health (OSH). OSH involves efforts to protect workers from work-related accidents and illnesses, enabling them to work safely, comfortably and productively. (Putri, N. A. 2024).

Fire service personnel are a high-risk group of workers as they face daily hazards such as extreme temperatures, exposure to toxic fumes, building collapses, and explosions. Therefore, the availability of Personal Protective Equipment (PPE) and workplace supervision are key factors in ensuring the safety of these personnel. According to Pratama et al. (2024)**,** monitoring the use of PPE and compliance with safety procedures is crucial to the successful implementation of occupational health and safety (OHS).

Based on the results of a preliminary survey at the Serang City Fire Service, PPE was found to be incomplete, such as the unavailability of rescue helmets, a limited number of masks, and the

absence of SCBA records. These conditions indicate that protection for personnel is not yet optimal, thereby potentially increasing the risk of workplace accidents.

The prevailing situation is that the quality of OSH implementation at the Serang City Fire Service remains low, as reflected in particular by the incompleteness and inadequate condition of PPE. This is consistent with research findings from various regions across Indonesia. A study conducted at the Padang City Fire Service in 2024 revealed that the available OSH equipment, such as SCBA, helmets, gloves and masks, remains incomplete. Furthermore, fire service personnel constitute a high-risk occupational group for workplace accidents; consequently, the implementation of OSH must be strictly enforced.

Previous research has shown differing results. Noviana et al. (2021) found that the implementation of OSH programs improved staff performance, whilst Anugrah and Untarini (2025) demonstrated that OSH programs had a positive impact on the performance of rescue team members. The discrepancy in these research findings indicates that a research gap still exists; therefore, a study is needed on the impact of the availability of PPE and workplace supervision on OSH among firefighters at the Serang City Fire Service.

The novelty of this study lies in the research location, which has not been previously studied within the Serang City Fire Service; the specification of variables, which focuses more on the availability of PPE and workplace supervision as predictors of OSH rather than OSH as a predictor of performance; the use of primary data from the Fire Service's internal checklist forms, which has not been extensively explored in previous research; and a quantitative approach involving field officers who face fire risks directly daily. Consequently, this study is important to conduct to provide an empirical contribution to the development of OSH policies within the Fire Service, particularly in Serang City.

LITERATURE REVIEW

Occupational Safety and Health (OSH)

According to Sastrini, Pertiwi, and Khoiri (2023)**,** Occupational Safety and Health (OSH) comprises a series of efforts to protect workers from the risk of accidents and work-related illnesses, thereby creating a safe and healthy working environment. Meanwhile, Haslinah (2024) explains that OSH is a protection system that encompasses hazard identification, risk control, and the prevention of workplace accidents. This view is reinforced by Sedarmayanti (2021), who states that the implementation of OSH is carried out through supervision, the use of PPE, workplace training, and the fostering of a safe work culture.

Availability of Personal Protective Equipment (PPE)

According to Daeli et al. (2024)**,** PPE is a set of safety equipment used by workers to protect the body from various potential hazards in the workplace**.** Haslinah (2024) states that PPE serves to protect workers from risks that may threaten their safety and health whilst at work. Furthermore**,** Fitri et al. (2024) and Fuady et al. (2024) explain that PPE is the final line of risk control capable of minimizing the impact of hazards when the source of risk cannot be eliminated.

Work Supervision

According to Dinda Aprillya et al. (2025)**,** work supervision comprises the activities of observation, inspection, evaluation, and follow-up carried out by management to ensure that all operational activities proceed in accordance with standard operating procedures. Furthermore, Handoko (2021) explains that supervision is the process of ensuring that work is carried out in accordance with the organization's plans, whilst Afandi (2021) states that supervision is carried out so that work can be carried out effectively, efficiently, and in accordance with applicable regulations.

Conceptual Framework of the Research

The Influence of Personal Protective Equipment (PPE) on Occupational Health and Safety (OHS)

The availability of comprehensive PPE that meets standards and is in good working order will provide optimal protection for fire service personnel whilst on duty. Conversely, the unavailability of PPE (such as zero rescue helmets, only two masks, and the absence of SCBAs) will increase the risk of injury, smoke inhalation, and death. Research (Daeli et al., 2024) indicates that the use of PPE has a positive and significant impact on the OSH of medical personnel. This implies that the better the availability and implementation of PPE, the higher the level of workers' OSH will be.

H_1: It is hypothesized that Personal Protective Equipment (PPE) influences Occupational Safety and Health (OSH)

The Impact of Workplace Supervision on Occupational Safety and Health (OSH)

Workplace supervision carried out consistently, in a tiered and systematic manner, will ensure that staff comply with OSH procedures, use PPE correctly, and immediately report hazardous conditions or damaged PPE. Conversely, weak supervision (such as a lack of verification by supervisors, unsystematic record-keeping, or a failure to follow up on findings) will increase procedural breaches and the risk of accidents. (Langitan et al., 2024) in their study of a construction project, they found that the supervision of OSH implementation has a very strong influence on workplace safety.

H_2: It is hypothesized that Work Supervision Influences Occupational Safety and Health (OSH)

The Simultaneous Influence of Personal Protective Equipment (PPE) and Work Supervision on Occupational Safety and Health (K3)

The availability of PPE and work supervision are two complementary factors. Even if a full range of PPE is available, it will not provide optimal protection if there is no supervision to ensure its use. Conversely, strict supervision will not be effective if the required PPE is not available.

Workplace supervision is a series of observation, inspection, evaluation, and follow-up activities carried out by supervisors or managers to ensure that all operational activities are conducted in accordance with standard operating procedures (SOPs), regulations, and applicable provisions, including compliance with the use of PPE and the implementation of OSH (Dinda Aprillya et al., 2025).

H_3: It is hypothesized that Personal Protective Equipment (PPE) and workplace supervision simultaneously influence occupational safety and health (OSH)

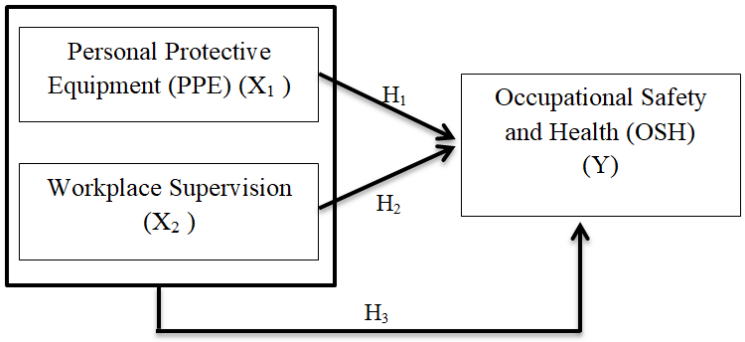

Figure 1: Conceptual Framework

METHOD

This study employs a quantitative approach to test the causal relationships between the variables formulated within the conceptual framework. This approach allows for the objective measurement of the impact of the availability of personal protective equipment (PPE) and workplace supervision on occupational health and safety (OHS). Quantitative methods are considered effective in producing reliable and generalizable empirical findings (Hair et al., 2021; Sugiyono, 2022).

Type and Design of the Research

This study employs a quantitative research method with an associative approach. Quantitative research is a research method grounded in the philosophy of positivism; it is used to investigate a specific population or sample, with data collection using research instruments, quantitative/statistical data analysis, and aims to test hypotheses (Sugiono, 2021). The main objective of this study is to

determine whether there is an influence of the variables, namely (X1) Personal Protective Equipment (PPE) and (X2) Workplace Supervision, on (Y) Occupational Health and Safety (OHS).

Research Location and Timeframe

This study was conducted at the Serang City Fire Service on Jl. Bangdes, Kp. Turus Pakupatan, Serang City, Banten Province. The research was carried out over a period of two months, **from April to July 2026**, covering the preparation, data collection, data processing, and compilation of the final report.

Population, Sample and Sampling Technique

The population of this study consists of 60 firefighters from the Fire Rescue Division of the Serang City Fire Service. In this study, the author employed a saturated sampling technique, whereby the entire population was included as the research sample. This technique was chosen because the population size is relatively small, enabling the researcher to obtain more accurate results with a minimal margin of error. Another term for a saturated sample is a census, whereby all members of the population are included in the sample, totaling 60 people.

Data Collection Techniques

Primary data were collected via an online questionnaire using Google Forms. The research instrument utilized a five-point Likert scale to measure the influence of Personal Protective Equipment (PPE) and workplace supervision on firefighters at the Serang City Fire Service. Secondary data typically consist of archives, reports, documentation, journals, books, or data sourced from relevant agencies. Imam Ghozali (2018)

Data Analysis Techniques

The data analysis techniques employed comprised several stages. Firstly, descriptive statistical analysis, which is used to describe the characteristics of each research variable, such as the mean, median, mode, standard deviation, minimum and maximum values. Secondly, testing of the research instrument, comprising validity testing using Pearson's product-moment correlation and reliability testing using Cronbach's alpha; classical assumption testing, which includes normality testing using the Kolmogorov-Smirnov and Shapiro-Wilk tests, a multicollinearity test by examining the Tolerance value, and a heteroscedasticity test via a scatterplot, multiple linear regression analysis, analysis of the coefficient of determination (R-squared), and hypothesis testing comprising the t-test and F-test, utilising the SPSS 29 software package.

RESEARCH FINDINGS AND DISCUSSION

Research Findings

This section presents the empirical findings obtained from the analysis of questionnaire data from 60 respondents who are officers of the Serang City Fire Service. The analysis was conducted using the associative quantitative method in SPSS 29 to test validity, reliability, and the structural relationships between variables. The results are presented systematically through descriptive analysis.

Research Data

Table 1. Research Data

Caption	Frequency	Percentage
Highest Level of Education		
Upper Secondary School / Vocational School	39	65 %
Diploma (1–D3)	3	6.6%
BACHELOR'S DEGREE (S1)	16	25.7%
POSTGRADUATE	1	1.7%
Length of Service		
< 1 year	1	1.7%
1–3 years	6	10 %
3–5 years	5	8.3%
> 5 years	48	80 %

Source: Data compiled by the author, 2026

As shown in Figure 2 above, regarding educational background, the majority respondents in this study were found to have completed vocational secondary school (SMKAI/SMK), totalling 39 people, representing 65 per cent; 4 respondents (6.6%) (D1–D3), and 1 respondent (1.7%) held a degree (S1). These results indicate the majority of respondents working at the Seraing Works Department have a final level of education of senior school (SMAI/SMK). As for the characteristics of the 60 respondents shown in Table 4.2, indicates 1 respondent (1.7 per cent) has been for less than 1 year, respondents (10) have been for between 1–3 years, totalling 6 people (10 per cent); those have been for 3–5 years, totalling 5 people (8.3 per cent); and those for more than 5 years, totalling 48 people (80 per cent).

Description of Research Variables

Table 2. Descriptive Statistics of Research Variables

Statistics				
		Y_Total	X1_Total	X2_Total
N	Valid	60	60	60
	Missing	0	0	0
Mean		39.88	39.65	40.15
Median		40.00	40.00	40.50
Mode		40	38	44
Standard Deviation		5.935	6,284	5.763
Minimum		24	18	28

Maximum	50	50	50
Sum	2393	2379	2409

Source: Data processed using SPSS 29

The mean values for the variables Personal Protective Equipment (PPE) (39.65), Work Supervision (40.14), and Occupational Safety and Health (39.88) indicate that respondents' average responses fall within the high category. The relatively small standard deviation suggests that the distribution of respondents' answers is fairly homogeneous or not too varied. Overall, the descriptive statistics show that the research data possess good characteristics and are suitable for use in multiple linear regression analysis and hypothesis testing.

Validity Test Results (Pearson's correlation coefficient/calculated r)

Table 1 Results of the Validity Test for the Occupational Health and Safety (OHS) Instrument

Indicator Item	Calculated r-value	Significance Value	Table r Value	Remarks
y1	0.695	< 0.01	0.254	Valid
y2	0.692	< 0.01	0.254	Valid
y3	0.693	< 0.01	0.254	Valid
y4	0.833	< 0.01	0.254	Valid
y5	0.719	< 0.01	0.254	Valid
y6	0.826	< 0.01	0.254	Valid
y7	0.818	< 0.01	0.254	Valid
y8	0.757	< 0.01	0.254	Valid
y9	0.664	< 0.01	0.254	Valid
y10	0.640	< 0.01	0.254	Valid

Based on Table 1.3, the results of the validity test for the employee performance variable instrument using Pearson's product-moment correlation indicate that all statement items have a calculated r value greater than $_{\text{the table value}}(0.254)$. $_{\text{The calculated}}$ r values for each item ranged from 0.640 to 0.826. These results indicate that all statement items meet the validity criteria. Consequently, all 10 statement items for the Occupational Health and Safety (OHS) variable are deemed valid. Therefore, all items can be used as instruments in this study

Reliability Test Results (Cronbach's Alpha)

Table 3. Reliability Test Results

Research Variables	Number Items	Cronbach's Alpha Value	Critical Limit	Description
Availability of Personal Protective Equipment (X1)	10	0.918	0.60	Highly Reliable
Work Supervision (X2)	10	0.896	0.60	Highly Reliable
Occupational Health and Safety (Y)	10	0.903	0.60	Highly Reliable

Source: SPSS 29 analysis

The results of the instrument reliability test show very high *Cronbach's Alpha* coefficients for all three research variables (> 0.80). Consequently, the data from this questionnaire instrument are proven to be reliable and stable for analysis in the next stage

Normality Test Results

Table 4. Results of the Normality Test

One-Sample Kolmogorov-Smirnov Test			
			Unstandardised Residual
N			60
Normal Parameters [a, b]	Mean		,0000000
	Standard Deviation		3.30776901
The Most Extreme Differences	Absolute		,130
	Positive		,130
	Negative		–0.105
Test Statistic			,130
Asymptotic Significance (2-tailed)[c]			,014
Monte Carlo Significance (2-tailed)[d]	Sig.		,013
	99% Confidence Interval	Lower Bound	,010
		Upper Bound	0.016

Source: SPSS 29 analysis

The results of the Kolmogorov–Smirnov test show a p-value of 0.014, which is less than 0.05, indicating that the data are not perfectly normally distributed

Multicollinearity Test Results

Table 5 Results of the Multicollinearity Test

Coefficients[a]								
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6.132	3,106		1,974	,053		
	total X1	,484	,128	,513	3,781	<,001	,296	3,373
	total x²	,363	,140	,352	2,597	,012	,296	3,373
a. Dependent Variable: total y								

Source: SPSS 29 analysis

Based on the analysis results, both independent variables (X1 and X2) have a *Tolerance* value of 0.296 (greater than 0.10) and a VIF value of 3.373 (well below the maximum limit of 10.00). It can be concluded that this regression model is free from multicollinearity.

Heteroscedasticity Test

Table 6. Results of the Heteroscedasticity Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardised Residual	,130	60	,014	,963	60	,067
a. Lilliefors Significance Correction						

Source: SPSS 29 analysis

Based on Table 6 of the Shapiro-Wilk test, the p-value is 0.067 (> 0.05), indicating that the data are relatively close to a normal distribution. Given the sufficiently large sample size (n = 60), in accordance with the Central Limit Theorem, the regression analysis may proceed. Nevertheless, the interpretation of the research results must be carried out with caution as the assumption of normality is not fully met. The researcher must not rely solely on the p-value but must take this limitation into account when formulating conclusions.

Results of the Multiple Linear Regression Test

Table 7 Results of the Multiple Linear Regression Test

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Standard Error	Beta		
1	(Constant)	6.132	3,106		1,974	,053
	Availability of PPE X1	,484	,128	,513	3,781	<,001
	Work Supervision X2	,363	,140	,352	2,597	,012

Source: SPSS 29 analysis

Based on Table 7, the results of the multiple linear regression analysis indicate that, when considered individually, the intensity of Personal Protective Equipment (PPE) and workplace supervision have a positive and significant effect on Occupational Health and Safety (OHS). This finding indicates that an increase in each independent variable tends to be followed by an increase in Occupational Safety and Health (OSH), assuming that other variables remain constant or unchanged.

Results of the Coefficient of Determination (R-squared) Test

Table 8 Results of the Coefficient of Determination (R-squared) Test

Model Summary[b]				
Model	R	R-squared	Adjusted R-squared	Standard Error of the Estimate
1	,830[a]	,689	,678	3,365
a. Predictors: (Constant), total x2, total X1				
b. Dependent Variable: total y				

Source: SPSS 29 analysis

Based on Table 8, the analysis results show that the correlation coefficient (R) is 0.830. R-squared of 0.689 (68.9%) indicates that 68.9% of the variation in the Occupational Health and Safety (OHS) variable for fire service personnel can be explained simultaneously by the factors of PPE Availability (X_1) and Work Supervision (X_2).

Results of the t-test (Partial)

Table 9. Results of the t-test (Partial)

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Standard Error	Beta		
1	(Constant)	6.132	3,106		1,974	,053
	Availability of PPE X1	,484	,128	,513	3,781	<,001
	Work Supervision X2	,363	,140	,352	2,597	,012

Source: SPSS 29 analysis

Based on Table 9, which shows the results of the test | Personal Protective Equipment (PPE) (X1), with a significance level of 0.001 < 0.05 and a calculated t-value of 3.781 > the table t-value of 2.002, the first hypothesis (H_1) is accepted. Furthermore, the t-test | Supervision (X_2) shows a p-value of 0.012 < 0.05 and a calculated t-value of 2.597 > the critical t-value of 2.002; therefore, the second hypothesis (H_2) is accepted. |, Personal Protective Equipment (PPE) and Work Supervision have a positive and significant effect on Occupational Health and Safety (OHS) among staff of the Public Order and Public Welfare Department of Seraing.

Results of the F-test (Simultaneous)

Table 10. Results of the F-test (Simultaneous)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1432.65	2	716.322	63.25	< 0.001
Residual	645.539	57	11.325		
Total	2,078.18	59			

Source: SPSS 29 analysis

Based on Table 10 above, the calculated F-value obtained is 63.250 > the table F-value (3.16), with a significance level (Sig.) of < 0.001. Given that the significance value obtained is far smaller than the test significance level (0.001 < 0.05), the regression model is deemed to fit very well, and the simultaneous hypothesis is accepted. This means that the availability of Personal Protective Equipment (X1) and workplace supervision (X2) simultaneously have a significant effect on the Occupational Health and Safety (OHS) of Serang City Fire Service personnel.

Discussion

The Effect of the Availability of Personal Protective Equipment (PPE) on Occupational Safety and Health (OSH)

The results indicate that the availability of Personal Protective Equipment (PPE) has a positive and significant effect on the Occupational Safety and Health (OSH) of firefighters in Serang City. This finding demonstrates that adequate PPE availability is a dominant factor in ensuring and improving the safety and health of firefighters while performing their duties. Properly provided PPE

can reduce workers' exposure to occupational hazards and minimize the risk of injuries and other work-related health problems. These findings are consistent with the study by Daeli, Zebua, Mendrofa, and Baene (2024), which reported that PPE use has a positive and significant effect on Occupational Safety and Health (OSH). Therefore, ensuring the availability, adequacy, and proper use of PPE is essential for supporting safe working conditions and strengthening OSH practices among firefighters. Effective PPE management should also be accompanied by regular monitoring and appropriate education.

The Effect of Work Supervision on Occupational Safety and Health (OSH)

The findings indicate that workplace supervision has a positive and significant effect on the Occupational Safety and Health (OSH) of personnel in the Serang City Fire Service. Effective supervision by squad commanders plays an important role in ensuring that firefighters consistently comply with established Standard Operating Procedures (SOPs) during emergency operations. Strict structural supervision helps prevent personnel from entering hazardous areas without proper coordination and ensures that safety procedures are followed before and during firefighting activities. In addition, supervision supports the safe rotation of personnel, allowing firefighters to manage physical fatigue and reduce potential occupational risks. These findings demonstrate that consistent and effective supervision is an essential component of OSH management in firefighting operations. Strengthening supervisory practices can therefore contribute to safer working conditions, improved discipline, and better protection of firefighters from occupational hazards.

The Impact of the Availability of Personal Protective Equipment (PPE) and Work Supervision on Occupational Safety and Health (OSH)

The findings indicate that the availability of Personal Protective Equipment (PPE) and workplace supervision simultaneously have a significant effect on the Occupational Safety and Health (OSH) of Serang City Fire Service personnel. Comprehensive and appropriate PPE cannot provide optimal protection when workplace supervision is weak, as inadequate supervision may result in improper use or reluctance to wear PPE. Conversely, strict supervision cannot effectively support OSH when the available PPE is insufficient, damaged, or unsuitable for operational conditions. These findings highlight the importance of integrating adequate PPE provision with effective workplace supervision to strengthen occupational safety practices. The results are consistent with Langitan, Thambas, and Rompis (2025), who found that expert involvement, worker compliance, and OSH supervision simultaneously have a significant effect on occupational safety. Thus, both factors should be strengthened concurrently.

CONCLUSION

This study concludes that the availability of Personal Protective Equipment (PPE) has a positive and significant influence on the Occupational Safety and Health (OSH) of Serang City Fire Service personnel. The more complete, serviceable, and standard-compliant the PPE available to personnel is, the better the level of occupational safety and health they experience whilst carrying out their duties.

Furthermore, workplace supervision has also been shown to have a positive and significant impact on the OSH of officers. Supervision carried out consistently by superiors or squad commanders whether through routine inspections, evaluations, or follow-up on findings in the field can encourage officers to comply with occupational safety procedures, thereby minimizing the risk of accidents. Simultaneously, the availability of PPE and workplace supervision have also been shown to have a simultaneous effect on officers' OSH. These two factors complement one another: comprehensive PPE will not provide optimal protection without supervision to ensure its use, and conversely, strict supervision will be of little use if the available PPE is limited or in an unfit condition.

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