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Quantitative Research Article

The Relationship Between Self-Efficacy and Safety Knowledge on Safety Performance Among Construction Workers at the BTN Eco Park Gandul Project in 2025

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Abstract

Background/ problem: A constructions is high-risk sector cause 200,000 fatalities due to work accidents annually, representing 63% of all workplace deaths. Previous research on safety performance has predominantly focused on organizational factors and has yet to integrate demographic factors with individual psychological factors such as self-efficacy and safety knowledge, particularly among construction workers in Indonesia.

Objective/ purpose: . This study aims to analyze the relationship between age, tenure, education level, self-efficacy, and safety knowledge with safety performance among construction workers at the BTN Eco Park Gandul Project.

Design and Methodology: The study employed a cross-sectional design with a quantitative approach involving 117 workers selected through purposive sampling. Data were collected using standarr questionnaires and analyzed using the Chi-square test.

Results: The results indicate that the majority of respondents demonstrated high safety performance (65%), high self-efficacy (57.3%), and high safety knowledge (65%). Bivariate analysis revealed significant associations between age ($p=0.048$), tenure ($p=0.004$), education level ($p=0.002$), self-efficacy ($p=0.032$), and safety knowledge ($p<0.001$) with safety performance. It is concluded that age, tenure, education level, self-efficacy, and safety knowledge are associated with safety performance, as indicated by p -values <0.05 .

Conclusion and Implications: The study recommends integrating self-efficacy enhancement programs through safe work simulations with supervisor feedback and strengthening safety knowledge through regular training tailored to workers' education levels.

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Introduction

Construction workers are individuals who play a central role in the implementation of development projects and are exposed to a high risk of occupational accidents. Workers' safety performance significantly influences accident prevention, productivity, and project sustainability. However, many construction workers tend to neglect safety procedures due to low self-confidence and inadequate safety knowledge. Safety performance encompasses workers' ability to comply with safety procedures, avoid unsafe behaviors, and actively participate in maintaining workplace safety. Suboptimal safety performance may lead to increased accident rates, economic losses for companies, and social consequences for workers and their families.

Based on Bandura's Albert Bandura Social Cognitive Theory (1991), safety performance is formed through the interaction between personal, behavioral, and environmental factors. Personal factors include self-efficacy and safety knowledge, which constitute critical psychological determinants. Nevertheless, a gap frequently exists between workers' safety knowledge and actual safety practices in the field, whereby knowledge alone does not directly translate into safe behavior. In this context, self-efficacy functions as a mediating mechanism that transforms knowledge into concrete action. Therefore, understanding how self-efficacy and safety knowledge influence safety performance is essential for designing more effective interventions.

Construction workers face a high risk of occupational accidents with potentially fatal consequences. Data from the International Labour Organization (ILO, 2023) indicate that the construction sector accounts for approximately 200,000 deaths annually, representing 63% of all workplace fatalities. In Indonesia, occupational accidents increased significantly from 370,747 cases in 2023 to 462,241 cases in 2024, with the construction sector contributing 30% of all national workplace accidents (Lestari et al., 2020; Satu Data Kemnaker, 2025). A preliminary study conducted at the BTN Eco Park Gandul Project revealed 22 workplace accident incidents between January and November 2025, with unsafe acts identified as the primary cause. Observations indicated that compliance with personal protective equipment (PPE) usage remained suboptimal and violations of work procedures were still prevalent. Interview findings further revealed that several workers experienced difficulties in identifying and evaluating potential hazards and required stronger self-confidence prior to carrying out their tasks. These conditions suggest that existing occupational health and safety (OHS) programs have not been fully effective in fostering workers' self-efficacy and optimal safety behavior.

The novelty of this study lies in the limited number of studies examining the relationship between self-efficacy, safety knowledge, and safety performance among construction workers in Indonesia.

Research by Syarifah and Adiati (2018) analyzed Big Five personality traits, safety knowledge, and safety motivation but did not examine self-efficacy. Hadi (2023) investigated the effect of self-efficacy on employee performance in the manufacturing sector; however, the focus was on general employee performance rather than safety performance. Vioito (2021) identified associations between work tenure, educational level, personality, and safety knowledge with safety performance, yet did not include self-efficacy as a variable of interest. Therefore, this study seeks to address this research gap by examining the relationship between age, tenure, education level, self-efficacy, and safety knowledge with safety performance among construction workers at the BTN Eco Park Gandul Project.

Methods

Research Design

This study employed a quantitative method with a cross-sectional study design to determine the relationship of age, length of employment, educational level, self-efficacy, and safety knowledge on the safety performance of construction field workers at the BTN Eco Park Gandul Project, Limo District, Depok, in 2025.

Research Setting

The study was conducted among construction field workers at the BTN Eco Park Gandul Project, Limo District, Depok, from October to December 2025. The research site represents the center of employees' construction activities, making it an appropriate setting for describing working conditions and the daily activities of field workers.

Participants/Sample

The study population consisted of all field workers directly involved in construction activities and exposed to occupational accident risks at the BTN Eco Park Gandul Project. The inclusion criteria comprised field workers who were directly engaged in construction tasks, willing to complete the questionnaire, and present during the data collection period.

Sampling and Sample Procedures

The sample was selected using purposive sampling, which selects participants based on specific criteria relevant to the research objectives. This technique ensures that the selected participants are workers directly involved in field construction activities and exposed to the risk of occupational accidents. This is because some workers are only tasked with product finishing processes and therefore have a low risk of accidents.

The sample size was determined using the Lemeshow formula based on P1 (0,8) and P2 (0,5) values obtained from previous studies. The first step involved calculating the sample size under the assumption of an infinite population. Based on calculations across several variables, the largest sample size obtained was $n = 53$. The second step involved adjusting the sample size to enhance the validity and statistical power of the study.. because this study compared 2 groups, the total number obtained was 106 Therefore, the minimum sample size required for this study was 117 respondents who met the inclusion criteria and agreed to participate

Instruments and Procedures

Safety performance was measured using a questionnaire developed by Vinodkumar and Bhasi (2010), which was adapted into Indonesian by Vioito (2021). The questionnaire consisted of items rated on a 4-point Likert scale ranging from strongly inappropriate (1), inappropriate (2), appropriate (3), to strongly appropriate (4).

Self-efficacy was measured using the General Self-Efficacy Scale (GSE) developed by Ralf Schwarzer and Matthias Jerusalem (1995), which was adapted into Indonesian by Novrianto et al. (2019). The instrument consisted of items rated on a 5-point Likert scale ranging from strongly inappropriate (1), inappropriate (2), neutral (3), fairly appropriate (4), to strongly appropriate (5).

Safety knowledge was measured using a questionnaire developed by Vinodkumar and Bhasi (2010), which was adapted into Indonesian by Vioito (2021). The questionnaire consisted of items rated on a 4-point Likert scale ranging from strongly inappropriate (1), inappropriate (2), appropriate (3), to strongly appropriate (4).

All indicators of safety management practice variables (X), safety performance (Y), safety knowledge (Z1) and safety motivation (Z2) are declared valid, because they have discriminant validity with a loading factor value greater than 0.7 and a t-statistic value greater than 1.96 (5% significance level). All variables of safety management practice (X), safety knowledge (Z1), safety motivation (Z2), and safety performance (Y) show Composite Reliability and Cronbach Alpha values above 0.70, so they have good reliability. R-Square The R² value for safety knowledge (Z1) is 0.3512 which is categorized as weak. The R² value for safety motivation (Z2) is 0.3434 which is categorized as weak. The R² value for safety performance (Y) is 0.7775 which is categorized as substantial

Demographic characteristics were measured using a demographic questionnaire that included respondents' age, length of employment, and educational level.

Data Analysis

Univariate analysis was conducted to describe the distribution and frequency of each variable. safety performance is declared Low if score ≤ 25 , median and High if score ≥ 25 , median

Bivariate analysis was performed to examine the relationships between the independent variables (age, length of employment, educational level, self-efficacy, and safety knowledge) and the dependent variable (safety performance). The statistical test employed was the Chi-square test with a significance level of $\alpha = 0.05$.

Ethical Considerations

This study received ethical approval from the Research Ethics Committee of Universitas Pembangunan Nasional Veteran Jakarta with ethical clearance number: 284/XI/2025/KEP.

Results

Univariate Analysis

Univariate analysis was conducted to describe the distribution and frequency of safety performance, age, length of employment, educational level, self-efficacy, and safety knowledge variables. The respondents involved in this study were 117 construction workers from the BTN Eco Park Gandul Project in 2025 (Table 1).

Tabel 1. Univariat Analysis

Variables	Frequency (n)	Percentage (%)
<i>Safety performance</i>		
Low (≤ 25)	41	35
High (>25)	76	65
Total	117	100

Based on Table 1, the frequency distribution of safety performance among construction workers at the BTN Eco Park Gandul Project showed that, out of 117 respondents, 41 workers (35%) demonstrated low safety performance, whereas the majority of respondents, namely 76 workers (65%), demonstrated high safety performance.

Table 2. Univariate Analysis

Variables	Frequency (n)	Percentage (%)
Age		
Young	54	46,2
Old	63	53,8
Years of Service		
New	56	47,9
Long	61	52,1
Level of Educations		
Low	34	29,1
High	83	70,9
<i>Self-efficacy</i>		
Low	50	42,7
High	67	57,3
<i>Safety knowledge</i>		
Low	41	35
High	76	65

Based on Table 2, the majority of respondents were categorized as older workers (53.8%), had longer work experience (52.1%), and possessed a higher educational level (70.9%). Regarding the other variables, more than half of the respondents demonstrated high self-efficacy (57.3%) and high safety knowledge (65%). This distribution indicates that most construction workers at the BTN Eco Park Gandul Project had adequate work experience and a good level of safety knowledge.

Bivariate Analysis

Table 3. Bivariate Analysis

Variables	Safety performance						P-value	POR (95%CI)
	Low		High		Total			
	n	%	n	%	n	%		
Variabels								
Age								
Young	24	44,4	30	55,6	54	100	0.048	2,16 (0,999-4,689)
Old	17	27,0	46	73,0	63	100		Ref
Years of Service								
New	27	48,2	29	51,8	56	100	0.004	3,12 (1,413-6,916)
Long	14	23,0	47	77,0	61	100		Ref
Level of Educations								
Low	19	55,9	15	44,1	34	100	0.002	3,51 (1,525-9,088)
High	22	26,5	61	73,5	83	100		Ref
Self-efficacy								
Low	23	46,0	27	54,0	50	100	0.032	2,31 (1,068-5,035)
High	18	26,9	49	73,1	67	100		Ref
Safety knowledge								
Low	24	58,5	17	41,5	41	100	<0.001	4,90 (2,152-11,157)
High	17	22,4	59	77,6	76	100		Ref

Based on Table 3, the results of the bivariate analysis demonstrated that all variables were significantly associated with safety performance ($p < 0.05$). Older workers showed a higher proportion of high safety performance (73.0%) compared with younger workers (55.6%) ($p = 0.048$; $POR = 2.16$). Workers with longer work experience demonstrated a higher proportion of high safety performance (77.0%) compared with those with shorter work experience (51.8%) ($p = 0.004$; $POR = 3.12$). Workers with higher educational attainment demonstrated a higher proportion of high safety performance (73.5%) compared with workers with lower educational attainment (44.1%) ($p = 0.002$; $POR = 3.51$). Workers with high self-efficacy demonstrated a higher proportion of high safety performance (73.1%) compared with workers with low self-efficacy (54.0%) ($p = 0.032$; $POR = 2.31$). Furthermore, workers with high safety knowledge demonstrated a higher proportion of high safety performance (77.6%) compared with workers with low safety knowledge (41.5%) ($p < 0.001$; $POR = 4.90$).

Discussions

Among the 117 construction workers at the BTN Eco Park Gandul Project, 35% demonstrated low safety performance. Workers with low safety performance consistently exhibited unsafe behaviors, including failure to use complete personal protective equipment (PPE), taking dangerous shortcuts, and ignoring safety signs (Awolusi et al., 2022; Chan et al., 2023). The majority of respondents were categorized as older workers (53.8%) and had longer work experience (52.1%). Older workers tended to be more cautious and disciplined in using PPE, whereas younger workers were more likely to engage in risk-taking behaviors (Bilim, 2025). Work experience enhances workers' ability to identify hazards and improves the efficiency of information processing (Aroke et al., 2022; Zheng et al., 2023).

A total of 70.9% of respondents had a higher educational level. Educational attainment influences safety behavior and the ability to understand complex safety instructions (Chan et al., 2023; He et al., 2023). Most respondents demonstrated high self-efficacy (57.3%) and high safety knowledge (65%). High self-efficacy increases workers' motivation to comply with safety procedures and proactively prevent workplace accidents (Lyu et al., 2025; Van Tam, 2025). Meanwhile, safety knowledge enables workers to identify hazards and prevent accidents effectively (Mazzetti et al., 2020; Sidiq & Rohman, 2023).

Relationship Between Age and Safety Performance

A significant relationship was found between safety knowledge and safety performance ($p < 0.001$; $POR = 4.90$). Workers with low safety knowledge were 4.90 times more likely to demonstrate low safety performance. Safety knowledge about safe work methods, equipment usage, accident risk reduction, and preventive measures is a fundamental requirement for achieving optimal safety

performance, as it equips workers with information about hazards, safe work methods, and emergency procedures (Sidiq & Rohman, 2023; Sinaga & Sinaga, 2022; Vioito, 2021).

Relationship Between Length of Employment and Safety Performance

A significant relationship was found between length of employment and safety performance ($p = 0.004$; POR = 3.12). Workers with shorter work experience were 3.12 times more likely to demonstrate low safety performance. Experienced workers tend to have better safety perceptions, higher compliance with safety procedures, and lower involvement in occupational accidents (Isa et al., 2021; Saari et al., 2024).

Relationship Between Educational Level and Safety Performance

A significant relationship was identified between educational level and safety performance ($p = 0.002$; POR = 3.51). Workers with lower educational attainment were 3.51 times more likely to demonstrate low safety performance. Education equips workers with better abilities to understand safety information, work instructions, and standard operating procedures (SOPs) (Chan et al., 2023; Vioito, 2021).

Relationship Between Self-Efficacy and Safety Performance

A significant relationship was identified between self-efficacy and safety performance ($p = 0.032$; POR = 2.31). Workers with low self-efficacy were 2.31 times more likely to demonstrate low safety performance. High self-efficacy encourages workers to proactively identify risks, comply with safety procedures, and undertake preventive actions (Aula et al., 2021; Saleem & Malik, 2022; Yen et al., 2022).

Relationship Between Safety Knowledge and Safety Performance

A significant relationship was found between safety knowledge and safety performance ($p < 0.001$; POR = 4.90). Workers with low safety knowledge were 4.90 times more likely to demonstrate low safety performance. Safety knowledge constitutes a fundamental requirement for achieving optimal safety performance, as it equips workers with information regarding hazards, safe working methods, and emergency procedures (Sidiq & Rohman, 2023; Sinaga & Sinaga, 2022; Vioito, 2021).

Analysis of Interaction Among Variables

Safety performance is influenced by the complex interaction among age, length of employment, educational level, self-efficacy, and safety knowledge. Workers with an optimal combination of these five factors are more likely to demonstrate good safety performance. Self-efficacy functions as a bridge linking safety knowledge to safety performance (Love et al., 2022; Susanto et al., 2023). Therefore, comprehensive safety interventions should consider all dimensions of personal factors holistically.

Limitations

Data were collected using self-report questionnaires, which may have introduced social desirability bias, whereby respondents tended to provide answers perceived as socially acceptable rather than reflecting their actual conditions. In addition, this study was conducted at only one construction project site; therefore, the findings may not be generalizable to other construction projects with different characteristics.

Conclusion

The majority of workers showed high safety performance (65%) and low safety performance (35%). Safety performance was significantly related to personal factors such as age, length of service, and education level, as well as self-efficacy and safety knowledge. Therefore, efforts are needed to improve safety performance by enhancing safety knowledge as a modifiable factor.

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Declarations

Conflicts of Interest: No conflicts of interest.

Ethical Approval Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Research Ethics Committee of the Universitas Pembangunan Nasional Veteran Jakarta, number: 284/XI/2025/KEP for studies involving humans.

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