Original Research

The Indonesian Journal of Public Health
Vol 20 No. 2 August 2025
p- ISSN 1829-7005 e- ISSN 2540-8836

ANALYSIS OF FACTORS RELATED TO SAFE BEHAVIOR OF WORKERS (Cross-sectional Study: Construction Project Building X, Purwokerto)

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ABSTRACT

Introduction: The work environment must prioritize the implementation of Occupational Safety and Health (OSH) measures to prevent accidents and work-related illnesses. A key aspect of Occupational Safety and Health implementation is the promotion of safe behavior among workers. This is particularly crucial in the construction sector, where workers are frequently exposed to high-risk conditions. According to the Indonesian Employment Social Security Administration, construction-related incidents accounted for the highest proportion of work accidents in 2023, contributing 32% of all reported cases. Building X in Purwokerto is one such construction project that is currently ongoing and subject to these occupational safety concerns. **Aims:** This research aims to determine the factors related to safe behavior in construction workers in Building X, Purwokerto. **Methods:** A cross-sectional design was applied, and the population included all construction workers in Building X, consisting of 89 workers. The independent variable measured is safe behavior, while the dependent variables include age, work experience, length of service, knowledge, attitudes, availability of Personal Protective Equipment (PPE), training, supervision, and regulations. The instrument used was a questionnaire containing questions about age, work experience, length of service, knowledge, attitudes, training, supervision, and regulations. **Results:** There is no significant correlation between age, length of service, work experience, knowledge, attitudes, training, and regulation and safe behavior with p-value >0.05. **Conclusion:** There is no significant correlation between age, length of service, work experience, knowledge, attitudes, training, and regulations, and safe behavior among workers in Building X.

Keywords: Length of service, Work Experience, Knowledge, Attitudes, Training, and Regulations

INTRODUCTION

Occupational Safety and Health (OSH) is a critical component of any work environment. Effective implementation not only ensures the well-being of workers but also contributes to increased worker productivity. This research shows that there is a significant relationship between Occupational Safety and Health and work productivity among workers at PT. Air Manado (Budiharjo et al., 2017). The execution of Occupational Safety and Health is useful for identifying potential hazards, assessing risks, and controlling risks.

This execution of Occupational Safety and Health is carried out in order to prevent accidents and work-related illnesses, thereby leading to an optimal increase in workers' productivity. Senjayani et al. (2019) reported that risk assessments were carried out on workers loading and unloading containers with cranes at South Jamrud Terminal of Tanjung Perak Port. The goal is to reduce workplace risks to a minimal and manageable level, one that is deemed acceptable by management, thereby ensuring the realization of safe working conditions.

The construction sector is inherently high-risk and possesses significant potential for hazards and occupational dangers. Based on statistical data in Indonesia, it is evident that the number of work accidents in Indonesia caused by unsafe actions reaches 80%,

Cite this as: Parmasari, D.H., Suryanto, Rubai, W.L and Isnubroto, D, (2025). Analysis Of Factors Related To Safe Behavior Of Workers (Cross-sectional Study: Construction Project Building X, Purwokerto). The Indonesian Journal of Public Health, 20(2), 288-301. https://doi.org/10.20473/Ijph.v20i2.2025.288-301

 doi: 10.20473/ijph.vl20i2.2025.288-301
Received 27 March 2024, received in revised form 24 July 2025, Accepted 31 July 2025, Published online: August 2025. Publisher by Universitas Airlangga

while 20% of work-related accidents are caused by dangerous conditions. The results indicate that there is a strong correlation between unsafe behavior and unsafe conditions on the incidence of work accidents in the construction sector, namely 64.6% (Primadianto et al., 2018).

Data from the Social Security Administration Agency for Employment of Indonesia in 2019 showed that work accidents in the construction sector contributed 173,105 cases in 2018, of which 36 cases occurred in the construction sector. This showed that the incidence of work accidents in construction was high.

Many factors can cause work accidents in the construction sector, such as unsafe actions (unsafe actions) and unsafe conditions (unsafe work environments). An unsafe action refers to any action performed by a worker that compromises safety during the execution of a task. Such behavior typically results from the failure to adhere to established and mutually agreed-upon work procedures. In the construction industry, unsafe action can be influenced by several factors, including inadequate recognition of occupational health and safety by employers, insufficient training on the use of workplace technologies, weak enforcement of sanctions for non-compliance, lenient Standard Operating Procedures (SOPs), and suboptimal integration of technology into the production process (Suárez et al., 2017).

This research shows that unsafe actions are influenced by factors, namely individuals, work groups, supervision, contractors, environmental conditions, project management, organizations, and society. The results show that there is a meaningful relationship between workload, safety, health training in the workplace, and Personal Protective Equipment (PPE) with the frequency of work accidents among workers involved in construction projects at the hospital. An excessive workload, when not supported by adequate energy intake, can lead to unsafe actions in the workplace. Prolonged physical and mental fatigue reduces workers' ability to concentrate, increasing the likelihood of negligence and the occurrence of unsafe behaviors (Nabila et al., 2022).

Unsafe action can occur because workers' commitment to implementing safe behavior is still low and has not been fully formed. The results of previous research show that the implementation of safe behavior is still low, due to multiple workers engaging in risky behaviors in the urea bagging section at PT Pupuk Kalimantan Timur. These include abnormal speeds, inappropriate use of PPE, inappropriate placement of equipment and goods, unergonomic lifting positions, unsafe body positions, and joking (Septiana, 2014). Based on the research carried out by Larasati et al. (2022), various factors affected the safe conduct of construction workers. These factors include the level of knowledge of workers, attitudes of workers, training carried out by the company, motivation, availability of PPE, age, psychological condition (work stress), and time pressure due to project targets.

The results showed that there is a meaningful correlation between supervision conducted by the Health Safety and Environment (HSE) group or foremen on the safe behavior of implementing workers on construction projects. Supervision will encourage implementing workers on construction projects to work in accordance with Standard Operating Procedures (SOP). In addition, there is a meaningful correlation between worker age and time pressure for completing construction projects and safe behavior. Age has a significant correlation with safe behavior among construction workers. As workers age, they tend to develop greater insight and experience related to their tasks, along with improved emotional control, which contributes to safer behavior compared to their younger counterparts.

Research also indicates that time pressure to meet deadlines can cause workers to rush through tasks, reducing their alertness and attention to detail, which increases the risk of unsafe actions. Time pressure to complete construction projects often leads to increased workloads and the need for overtime work. Without proper stress management and sufficient nutritional support, this can result in significant physical and mental exhaustion.

Research conducted by Mosly (2019) reported that there are management and non-management factors that influence the safety atmosphere and safe behavior of workers in the construction sector. Management-related factors influencing Occupational Safety and Health include management commitment, regulations and procedures, supervision and supervision, communication, socialization and training, work pressure and intensity, availability of Occupational Safety and Health resources, environmental support, reward and punishment system, social security, and health insurance. Meanwhile, non-management factors (internal individuals) that influence safety climate and safe behavior are construction worker education, attitudes towards occupational safety and health, perceptions of potential dangers and risks in the environment, competence and knowledge, and commitment to safety and Occupational Health. An investigation by Fara et al. (2017) showed that a meaningful connection exists between the knowledge about work-related safety and health, the attitudes of safety and health at the workplace, and motivation to behave safely towards safe behavior, with a p-value of <0.05 for civil partnership workers at PT Indonesia Power Up Semarang. Building X is a construction project scheduled for early 2023 in Purwokerto, Central Java. The project involved 89 workers and consisted of four structures, designated A, B, C, and D, constructed simultaneously. Structures A, C, and D each have two floors, while B consists of three floors.

The construction of all buildings is currently still underway and is expected to be completed in early 2024. The construction of the four buildings involves the person in charge of the project and a foreman whose job is to supervise building construction activities. Building construction work started at 7 am and ended at 4 pm. The standard workweek runs from Monday to Saturday. However, on Saturdays, construction workers operate on a shortened schedule, working from 7:00 a.m. to 1:00 p.m. Owners of building construction projects use the services of contractors and consultants. Currently, the process of building has reached the stage of installation of a multi-storey building construction. The results of interviews conducted by researchers with those responsible for the project in the field showed that the building construction process started with earth and sand work, multi-storey building construction installation work, floor work, and finally electrical installation work. Earth and sand work started with digging the soil for the building foundation.

The foundation must be constructed with strength and stability, as it serves as the structural base upon which the entire building rests. Once the foundation is completed, the next phase involves constructing the structural framework. This includes building essential support elements such as columns (pillars) and floor slabs. This part is crucial because it acts as a support for the building. After the structural construction work, finishing work follows, which consists of wall plastering, painting, and floor installation. According to a previous investigation, construction projects typically progress to the structural phase, which involves the development of key support components. Initial research conducted on 10 workers at Building X site showed several unsafe behaviors, including working at heights without proper precautions, joking while

working, rushing through tasks, smoking during work, and failing to return equipment to its designated place after use.

Research on the analysis of factors related to safe behavior among workers on the Building X construction project, Purwokerto, needs to be carried out with the aim of finding out the factors related to safe behavior. Understanding the factors related to safe behavior allows workers, contractors, and project owners to make informed improvements that enhance workplace safety. Such efforts contribute to the prevention of accidents and work-related illnesses.

METHODS

This research was carried out using a quantitative approach, with a cross-sectional design in which data were collected at a single point in time, and was conducted in February 2024. The population was all construction workers in Building X, Purwokerto. The sample was collected utilizing the total sampling method, with a total of 89 construction workers. The independent variable is safe behavior, while the dependent variables measured include: age, work experience, length of service, knowledge, attitudes, availability of PPE, training, supervision, and regulations. The instrument used was a questionnaire containing questions about age, work experience, length of service, knowledge, attitudes, availability of PPE, training, supervision, and regulations.

Univariate analysis was conducted in order to explain the characteristics of each variable. Two-way analysis was carried out with the chi-square test with a certainty degree of 95% (α=0.05) to determine the correlation between variables. Bivariate analysis was carried out to test the hypothesis between two variables to obtain an answer as to whether the two variables contain a relationship, are related, contain differences, or have an influence on the hypothesis formulated. Multivariate analysis with the logistic regression test was carried out to determine the factors that most influenced safe behavior. Research permits are regulated by the Health Research Ethics Commission (KEPK) of the Faculty of Health Sciences UNSOED and approved with letter number 1367/EC/KEPK/I/2024. Data was processed using statistical application software known as SPSS 25 software. Validity and reliability tests were carried out using statistical analysis (the Pearson Correlation test and Alpha Cronbach) based on the r value and Alpha value in the output of SPSS 25 software.

RESULT

Table 1. Validity Test Results of Knowledge Variables for Construction Workers in Building X, Purwokerto

Question	r value
Work safety is an effort to prevent accidents	0,414
Work can harm someone	0,419
Safe behavior can minimize accidents	0,344
Operating equipment must be based on SOP	0.491
Proper placement of equipment minimizes accidents.	-
Occupational safety and health protect workers	0,490
Not completely wearing PPE is safe behavior	0,442
PPE is not important in the workplace	0,826
Wearing PPE needs time, thereby not important	0,750
Wearing PPE completely is safe behavior	0,674

Table 2. Validity Test Results for Attitude Variables for Construction Workers in Building X, Purwokerto

Question	Calculated r value
Workers must work within	0,426

Question	Calculated r value
their authority	
I will remind others when doing unsafe behavior	0,770
The HSE coordinator must be in the field	0,659
Joking makes me feel unfocused	0,782
Wearing PPE is comfortable	0,719
The reminder board must be in place	0,369
Each worker must wear PPE	0,526
If I make mistakes, I will call the supervisor	0,747
Regulation makes me uncomfortable	0,459
Workers must not work based on procedure	0,632

Table 1 shows that 9 questions about knowledge are valid because they have a calculated r value > r table (0,374). Table 2 shows that 10 questions about attitude are valid because r value > R-squared table (0,374) based on the validity test.

Table 3. Validity Test Results for Training Variables for Construction Workers in Building X, Purwokerto

Question	r value
Given information about OSH and danger in the workplace	0,638
Given information about safe behavior in the workplace	0,707
Given training about OSH in the workplace	0,718
Given training about safe behavior in the workplace	0,793
Training can prevent accidents	0,791
Training can affect safe behavior	0,625
Training makes it easier to work	0,636
Training makes me careful in the workplace	0,521
Training increases productivity	0,693
Training is absolutely important in the workplace	0,716
Training increases awareness of work accidents	0,543
Training is a form of appreciation for workers.	-

Table 3 shows that 11 questions about training are valid because r value > R-squared table (0,374) based on the validity test.

Table 4. Validity Test Results for Supervision Variables for Construction Workers in Building X, Purwokerto

Question	r value
Working without supervision is no problem	-0,137
Supervision is important	0,736
Punishment from the supervisor to workers who exhibit unsafe behavior	0,209
Supervisor visits to the project site frequently	0,488
Supervisor observes the workers in the workplace	0,651
The supervisor gives a proper job	0,439
Workers can work well under the supervision	0,627

Table 5. Validity Test Results for Safe Behavior Variables for Construction Workers in Building X, Purwokerto

Question	r value
Using PPE when working	0,424
Not working in a hurry	0,540
Using appropriate equipment	0,272
Taking a safe work position	0,526

Question	r value
Comply with existing regulations	0,462
Put the equipment in the right place	0,415
Joking at the workplace while working	0,441
Smoking when working	0,119
Operating equipment outside authority	-0,176
Consuming drugs or alcohol in the workplace	-

Table 4 shows that 6 questions about supervision are valid because r value > R-squared table (0,374) based on the validity test. Table 5 shows that 6 questions about safe behavior are valid because r value > R-squared table (0,374) based on the validity test, and there are 4 questions are not valid because r value < R-squared table (0,374).

Table 6. Validity Test Results of Regulatory Variables for Construction Workers in Building X, Purwokerto

Question	r value
The regulation is important	0,523
The regulation is updated regularly	0,414
The regulation can be understood	0,622
The regulation is effective and efficient	0,437
The regulation is very strict	0,415
The regulation affects productivity	0,472
The regulation prevents accidents	0,551
The regulation has been implemented	0,275
The regulation makes it comfortable	-0,244
Workers are disciplined by regulation.	-

Table 6 shows that 6 questions about regulation are valid because r value > R-squared table (0,374) based on the validity test.

Table 7. The Distribution Frequency of Each Variable

Independent Variable	Safe Behavior				Total	
	Not good		Good			
	N	%	N	%	N	%
1. Age						
a. ≤30 years	18	20,2	15	16,9	33	37,1
b. >30 years	31	34,8	25	28,1	56	62,9
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
2. Work Duration						
a. ≥5 years (old)	35	39,3	25	28,1	60	67,4
b. <5 years (new)	14	15,7	15	16,9	29	32,6
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
3. Work experience						
a. Never	2	2,2	1	1,1	3	3,4
b. Once	47	52,8	39	43,8	86	96,6
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
4. Knowledge						
a. Not good	19	21,3	14	15,7	33	37,1
b. Good	30	33,7	26	29,2	56	62,9
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
5. Attitude						
a. Not good	25	28,1	19	21,3	44	49,4
b. Good	24	27	21	23,6	45	50,6
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
6. Training						
a. Not good	26	29,2	27	30,3	53	59,6
b. Good	23	25,8	13	14,6	36	40,4
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**

Independent Variable	Safe Behavior				Total	
	Not good		Good			
	N	%	N	%	N	%
7. Regulation						
a. Not good	19	21,3	8	9	27	30,3
b. Good	30	33,7	32	36	62	69,7
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
8. Supervision						
a. No supervision	0	0	0	0	0	0
b. There is supervision	49	55,1	40	44,9	89	100
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**
9. Personal Protective Equipment						
a. Complete	0	0	0	0	0	0
b. Incomplete	49	55,1	40	44,9	89	100
Total	**49**	**55,1**	**40**	**44,9**	**89**	**100**

Table 7 shows the distribution frequency of age, work duration, work experience, knowledge, attitude, training, regulation, supervision, and the availability of PPE.

Table 8. Recapitulation of Bivariate Chi-Square Test Results

Variable	p value
Age	0,941
Work Duration	0,371
Work experience	1,000
Knowledge	0,714
Attitude	0,741
Training	0,167
Regulation	0,055
Supervision	- (Homogeneous data)
Availability of Personal Protective Equipment	- (Homogeneous data)

Table 8 shows the results of the bivariate chi-square analysis. The results show that there is no significant relationship among the variables age, duration of service, employment experience, knowledge, attitudes, training, regulations, and supervision. The analysis was carried out using multivariate analysis using logistic regression. This is conducted to determine the most influential factor in safe behavior. The inclusion of research variables in the multivariate logistic regression analysis must meet specific requirements or criteria.

If the bivariate test results have a significance value <0.25, then the variable can be included as a candidate for the multivariate model. The variables included in the multivariate logistic regression analysis were the training and regulation variables because they had a p value <0.25.

Table 9. The Result of Multivariate Analysis with Logistic Regression

Variable	p value
Training	0,302
Regulation	0,094

Based on Table 9, there is no significant relationship between training or regulation to safe behavior because p value > 0,05.

DISCUSSION

The relationship between age and safe behavior

This research shows that there is no meaningful influence between age and *safe behavior* among construction workers in Building X. Sangaji (et al., 2018) reported that there was no correlation between age and unsafe behavior of shipyard workers at

PT X. However, the level of education, knowledge, attitude, and practice of safety riding awareness is correlated. There is no meaningful correlation found between age and the identification of riding safety awareness and safety riding practices among motorbike taxi drivers in Banyumanik District, Semarang.

The research of Untari et al. (2021) further reported that there is no significant correlation between a worker's age and their safe behavior in the production department at PT X, Jakarta. The results of this research are not in line with other investigations. The previous research conducted by Saputra et al. (2022) showed that the awareness of danger among construction workers was significantly correlated with their age. This tendency is attributed to the generally lower awareness of hazards among younger workers compared to their older counterparts. Younger workers often lack sufficient knowledge and may demonstrate less concern for established regulations in the construction project environment.

The relationship between work duration and safe behavior

This research shows that no discernible influence exists between work duration and safe behavior for those working in construction in Building X. Furthermore, 14 workers had a short work duration (<5 years) and had poor safe behavior, while 15 workers had a short work duration (<5 years) and had good safe behavior. This demonstrates that the differences are not very great. The consequences of the research are in line with Dzulfiqar et al. (2016), who stated that workers in welding workshops should behave safely regardless of the duration of their employment in the Pejompongan area, Bendungan Hilir District, Central Jakarta, in 2016. The results are also consistent with Putri et al. (2016), who reported that there was no correlation between tenure and responsible conduct in nurses at Depok Regional General Hospital (RSUD).

The relationship between work experience and safe behavior

The results show that there is no meaningful relationship between safe behavior and work experience. However, it differs from earlier investigations carried out by Pasambo (et al., 2023), which reported that there was a significant relationship between work experience and safe behavior in nurses at Dr Tadjuddin Chalid Hospital, Makassar.

This research is in line with previous investigations conducted by Gharibi (et al., 2016), which reported that there was no significant correlation between work experience and safe work attitudes among tunnel project workers in Boshehr, Iran, in 2013-2014.

There was a lack of connection between employment history and responsible conduct among construction workers. According to research, promoting a work environment that prioritizes safety and well-being will reduce the occurrence of work accidents, thereby the implementation of safe behavior will increase.

Previous research conducted by Prasetya et al. (2021) stated that unsafe actions during evacuation have the potential to affect the duration of evacuation if a fire disaster occurred in a hospital. This can have an impact on the severity of the impact of a fire disaster. Ayuni et al. (2022) reported that one indicator of good performance of workers is the implementation of safe behavior.

The relationship between knowledge and safe behavior

Research shows that workers with good knowledge have almost the same frequency distribution in implementing safe behavior. Among workers with good knowledge of safety, 30 exhibited poor implementation of safe behavior, while 26

demonstrated both good knowledge and proper implementation of safe behavior. This means that workers who have good knowledge about safe behavior do not necessarily actually carry out safe behavior. Good knowledge is not accompanied by high motivation to take action. Research by Faradisa et al. (2021) showed that there was a significant correlation between punishment, work motivation, safe behavior, and reward in the form of compliance with the use of PPE among workers at PT X Surabaya.

Research results indicate that among workers with good knowledge of safety practices, a greater number still exhibit poor safe behavior. Specifically, 30 workers demonstrated poor safety behavior, while only 26 workers with good knowledge consistently practiced safe behavior. This lack of significant differences is believed to be caused by a lack of work motivation, reward and punishment, as well as work safety and health culture. A literature study conducted by Simanjuntak et al. (2023) showed that work motivation is an individual factor that influences the occurrence of unsafe behavior in 113 construction workers aged 15 years. This is in line with Pasambo et al. (2023), who stated that work motivation is related to unsafe actions among construction workers at the Harper Kedang Hotel, Kupang City.

The relationship between attitude and safe behavior

The result demonstrates that among construction workers, there is no discernible relationship between attitudes and safe behavior in Building X. This is consistent with Rafi'ah et al. (2018), according to which plate cutting workers at PT PAL Indonesia's Commercial Ship Division do not significantly correlate their attitude with safe behavior. Other research also states that there is no significant relationship between attitudes and safe behavior practices among workers in the West Assembly unit at PT. XYZ (Nasrullah et al., 2014). The results are not in line with Septiani (2018), who found that with a closeness coefficient of 0.4, there was a reasonably strong correlation between safe behavior and support from co-workers among workers at PT Hanil Jaya Steel. A significant correlation was found in Maulidhasari et al. (2011), which showed that there is a meaningful relation between the attitudes of workers in the intake unit at PT Indonesia Power (UBP) Semarang in 2011 with their use of PPE, and their risky behavior.

There is no correlation between the attitudes of Building X workers and safe behavior. Furthermore, research results indicate that there is no discernible difference between workers with good attitudes who have poor safe behavior and those with good attitudes who have good safe behavior, namely 24 and 21 workers, respectively.

The absence of a significant relationship is caused by another factor, namely, co-worker support. Colleagues who do not invite other workers to violate standard operational work procedures that have been implemented will increase motivation to carry out safe behavior. Co-workers who do not ridicule workers for implementing safe behavior can motivate workers to carry out safe behavior.

The relationship between training and safe behavior

The research results indicate that there is no meaningful relationship between safe behavior and the training of construction workers in Building X. This is consistent with Sebrina et al. (2021), who reported that no relationship existed between training and unsafe actions among production workers at CV X plywood processing company. This is also in accordance with Putri et al. (2016), who reported that safety practices used by nurses at Depok City Regional General Hospital in West Java are unrelated to occupational safety and health training. However, this contradicts the results of

Sangaji et al. (2018), who reported a substantial relationship between occupational safety and health training and unsafe behavior carried out by workers at PT X shipyard.

The research of Suryanto et al. (2017) showed that training related to K3 is also necessary to raise workers' awareness of risks and unsafe behaviors at work. This is particularly for those loading and unloading, between the ages of 31 and 40, and who have only completed elementary school at PT Pelabuhan Indonesia III Tanjung Perak Branch.

The relationship between regulation and safe behavior

The research results showed that there is no meaningful correlation between regulations and safe behavior among construction workers in Building X. The results showed that 30 workers had a good perception of regulations and poor safe behavior, while 32 workers had a good perception of regulations and good safe behavior. This is in line with Suyono et al. (2013), which affirmed that regulations have a weak relationship with safe behavior in 73 workers at PT.

Surabaya Dock and Shipping did not find any evidence of a strong relationship between regulations and safe behavior among construction workers. Research by Tandiabang et al. (2023) stated that there exists an association between climate of safety and safe behavior through the intermediary factor of safe behavior motivation with p value = 0.001 for contractor workers at PT X. Sezer (2011) reported that a system of rewards and punishments significantly influences positive commitment and motivation toward safety behavior in an organization. This system may explain the reason there is no direct correlation between work experience and the consistent practice of safe behavior. The research of Jaya (2022) stated that rewards had a significant relationship with safe conduct from all workers at Sengkang Regional General Hospital, Wajo Regency, in 2021, with p value = 0.037.

A good award will motivate workers to implement good work behavior as well. There is a connection between punishment and safe behavior, according to earlier results. Workers in the construction environment will be consistent in implementing safe behavior if there is a punishment. This is because punishment will prevent unsafe behavior. Workers are afraid of sanctions imposed by the workplace (Rahman et al., 2020).

CONCLUSIONS

In conclusion, this research showed that age, work duration, work experience, knowledge, attitude, training, and regulation do not significantly correlate with the safe behavior of workers in Building X. The absence of a significant relationship is caused by other factors that have not been examined. The factors include motivation, co-worker support, reward and punishment, and work safety and health culture. Future researchers are encouraged to explore the relationship between motivational factors, peer influence, reward and punishment systems, and the occupational safety and health culture in relation to safe behavior among construction workers. Additionally, expanding the sample size by including a larger number of respondents is recommended to enhance the generalizability of the results.

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