www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)
Budapest Institute

Supervisory Behavior That Affects Worker's Safety Behavior in Construction Project

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Abstract

As development progresses in Indonesia, there is an increase in the number of work accidents in the Indonesian construction industry. Therefore, the researcher wants to identify the supervisory behavior of project supervisors that can significantly impact workers' safety behavior in construction projects and describe the appropriate impact path using Structural Equation Modeling (SEM). This study uses a purposive sampling method. In contrast, this study's sample is construction workers involved in construction projects that implement safety management at construction sites. The results obtained from confirmatory factor analysis and structural equation modeling indicate that there are direct and indirect impacts of supervisory behavior on worker safety behavior. Reactive and supportive actions had a direct impact on the safety behavior of workers (β = 0.036), but had no impact on the safety climate. In contrast, training and preventive actions had an indirect impact on worker safety behavior (β = 0.393), which was mediated by four safety climate factors, namely (1) worker involvement, (2) supervisory environment, (3) workmate influence and (4) competence.

Keywords
Supervisory behavior; safety climate; construction project; worker safety behavior

I. Introduction

The construction industry plays the most critical role in economic development in Indonesia and all developing countries. In developing countries such as Indonesia, the construction industry plays an essential role in the development process of producing infrastructures such as dams, irrigation buildings, roads, schools, and housing. The construction sector experienced a growth of 7.35% in Quarter I/2018 when compared to Quarter I/2017. Based on a report released by the Central Statistics Agency in May 2019, the construction sector is the fourth leading sector that significantly contributes to the national economy by contributing 10.20% of Indonesia's total Gross Domestic Product (GDP).

Construction in Indonesia is more labor intensive compared to developed countries, such as the United States. The Ministry of Public Works and Public Housing stated that in 2019 the total number of construction workers in Indonesia reached approximately 8.3 million people or about 7.4% of the national workforce. However, in line with this growth, there has been an increase in the number of work accidents in the Indonesian construction industry. According to data from the Ministry of Public Works and Public Housing in 2017, the construction sector is the most significant contributor to accident cases in Indonesia, with an average incidence of around 32% of all work accidents in Indonesia

DOI: *https://doi.org/10.33258/birci.v5i3.6498*

each year. the construction sector. Implementing construction safety management in Indonesia is still far from expected.

According to Heinrich et al. (1950), about 88% of all accidents are caused by the unsafe behavior of people. Similarly, Sawacha et al. (1999); Choudhry (2014); Zhang and Fang (2013) found that unsafe work behavior was the most common cause of accidents at construction sites. Managing workers with different backgrounds in the workplace requires proper safety management practices to improve worker safety behavior, behavior-based safety practices can change unsafe worker behavior into safe (Zaira and Hadikusumo 2017). Behavior-based safety practices are a common method of motivating workers to improve their behavioral safety performance as well as measuring and improving behavioral aspects of safety culture (Cooper 2000). Management behavior plays an important role in improving the performance of worker safety behavior, according to Fang also management behavior should be more considered as the main organizational antecedent of worker safety behavior (Fang et. al. 2015). Therefore, research is needed to identify management behaviors that can significantly impact worker safety behavior in construction projects. The supervisor behavior will be the focus of this study because they are the people who interact the most with workers among all levels of management.

II. Review of Literature

2.1 Supervisory Behavior

Choudhry (2014) argues that behavior is something someone does or says. While the definition of supervision according to Siagian in Sururama and Amalia (2020: 36), supervision is a process of observing rather than implementing the entire organization to ensure that all work being carried out goes according to a predetermined plan. Based on the opinion above, briefly the essence of the definition of supervisory behavior is an activity or action to ensure that implementation is in accordance with a predetermined and mutually agreed plan.

Zohar and Luria (2005) made an exploratory factor analysis and extracted three factors that could be seen as three different types of supervisory behavior, namely active practice, proactive practice and Declarative practice. In addition, in the study of Widhiastuti et al. (2021) also described Geller's Theory. The Psychology Of Safety Handbook describes the importance of a Behavioral Based Safety approach in work safety efforts, both in reactive and proactive actions. Reactive means that safety efforts are traced from unsafe or risky behavior (at risk behavior) that results in losses. Proactive means that work safety efforts are traced from safe behavior that results in a successful work accident prevention. (Geller 2001).

From a review of previous research it can be concluded that effective supervisory behavior in general can be divided into two categories, namely (1) proactive and preventive behavior such as safety training and safety instructions that aim to make all personnel on site become motivated and able to carry out accident prevention and (2) reactive behavior and improvement, which refers to monitoring, improving the behavior and situation of workers and providing support and assistance when needed. Therefore, the two parameters that will be used to measure supervisory behavior in this thesis are referred to as (1) proactive and preventive actions and (2) reactive and supportive actions..

2.2 Safety Climate As Mediating Variable

In addition, McGovern et. al. in (Neal & Griffin, 2004) also found that safety climate is one of the factors that can affect compliance with safety regulations. So this safety climate is highly correlated with outcomes related to worker safety behavior. Safety climate is the perception of policies, procedures and practices related to safety. In a broader level, the safety climate describes workers' perceptions of the value of safety in an organization (Neal & Griffin, 2004). In the model of safety culture interaction (SCI) proposed by Fang and Wu (2013), there are two basic elements, namely safety climate and safety behavior which have close interactions with each other. As a specific aspect of organizational climate, safety climate can be defined as the shared perception of organizational members about safety policies, safety processes and safety practices. Safety climate is also a distinctive cultural factor and an important indicator of safety priorities in organizations.

The safety climate model embodies the perceived safety values of workers and the priority behavior of supervisor in construction projects. By interacting with the supervisor, observing the supervisor actions and learning from the supervisor instructions and directions, workers can understand the supervisor expectations for improving safety knowledge and skills and workers can make behavioral decisions that are consistent with these cognitions. Based on the existing literature on group-level safety climate in construction projects, there are 4 (four) dimensions of safety climate, namely (1) workmate's influence, (2) supervisory environment, (3) workers' involvement, and (4) competence (Mohamed 2002, Fang et. al. 2015, Lingard et. al. 2010).

2.3 Worker's Safety Behavior

Safety behavior is defined as the behavior of individuals for their own safety and health as well as the work environment (Burke et. al. 2002). According to Neal et. al. (2000) there are two components of safety behavior, namely safety compliance and safety participation to describe the differences between individuals in the workplace. These two components have been widely accepted in academia and have been adopted by many studies related to safety behavior (Guo et. al. 2016; Vinodkumar and Bhasi 2010). Safety participation and safety compliance have often been used as indicators of safety performance (Vinodkumar and Bhasi 2010). Safety participation is defined as voluntary behavior that helps develop an environment to support safety activities in the workplace, for example helping colleagues, promoting workplace safety programs, demonstrating initiative, and seeking to improve workplace safety (Neal et. al. 2000). In contrast, safety compliance denotes the mandated behavior that must be performed to maintain safety in the workplace, such as wearing personal protective equipment and adhering to safety rules and procedures (Griffin and Neal 2002).

2.4 Relationship between supervisory behavior, safety climate and work safety behavior

According to Flin and Yule (2004) in general the management structure of a construction project has three layers, namely the strategic layer, the tactical layer and the operational layer. Accordingly, management behavior in construction projects can be divided into three behaviors, namely strategic, tactical and operational (Flin and Yule 2004). Strategic management is a senior management team led by a project manager. Tactical management is the middle management who is the head of a construction project department or unit. Operational management is the front line management team, namely supervisors or also called field implementers in construction projects. The supervisor has the most frequent contact with workers among the three layers of management and is the person directly responsible for ensuring good safety performance at the project site.

This study proposes a supervisory focused BBS method. In Figure 2.1 Zhang et. al. (2017)

illustrates that supervisor-focused BBS is designed to intervene through supervisor behavior to improve the group-level safety climate at the site. The supervisor-focused BBS also hypothesizes that an improvement in the safety climate can motivate workers to work safely and ultimately lead to an increase in worker safety behavior performance.

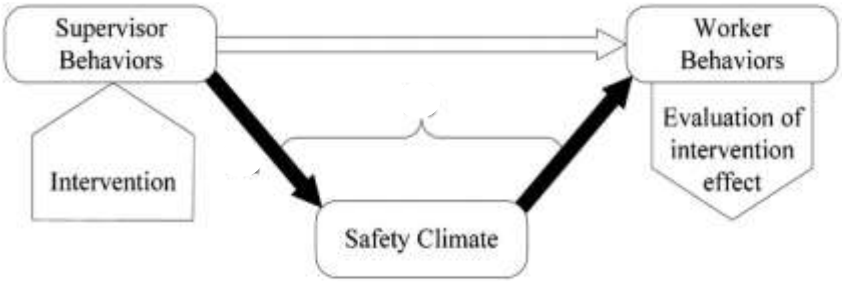

Figure 1. *Mechanism of the supervisor-focused BBS method* (*Zhang et. al. 2017*)

So based on the results of theoretical and empirical studies, the following hypothesis is formulated:

1. H1 : Training and preventive actions directly and positively affect worker safety behavior in construction projects
2. H2 : Reactive and supportive actions directly and positively affect worker safety behavior in construction projects
3. H3a : Training and preventive actions directly and positively affect the supervisory environment in project construction
4. H3b : Training and preventive actions directly and positively affect worker involvement in project construction
5. H3c : Training and preventive actions directly and positively affect worker competence in project construction
6. H4a : Reactive and supportive actions directly and positively affect the supervisory environment in project construction
7. H4b : Reactive and supportive actions directly and positively affect worker involvement in project construction
8. H5a : Supervisory environment is positively related to the workmate influence in project construction
9. H5b : Worker involvement is positively related to the influence of colleagues in project construction
10. H6a : Workmate influence directly and positively affects the safety behavior of workers in project construction
11. H6b : Competence directly and positively influences worker safety behavior in project construction

III. Research Method

The following are indicators of supervisory behavior, safety climate and worker safety behavior that have been compiled from various sources and previous studies that generally affect worker safety behavior at construction sites can be seen in the following **Table 1.**

Table 1. Research Variable

Training and preventive actions	
PP1	Supervisor conducts safety training for workers in weekly talks or meetings
PP2	Supervisor often explain safety issues and problems that occur on site
PP3	Supervisor require workers to be involved in safety inspections to increase worker safety awareness and help workers identify safety risks independently
PP4	Supervisor discusses with us how to improve safety on the job site
PP5	Supervisors often tell us about hazards in our work
PP6	Supervisor is very strict about working safely even when we are tired or stressed
PP7	Supervisor insists that we must follow safety rules when working on the job site
PP8	Supervisor is strict about safety even at the end of the shift, when we want to go home
Reactive and supportive actions	
PP9	If there is a safety hazard in the workplace, the Supervisor can immediately find and help eliminate the hazard
PP10	Supervisor conducts weekly on-site inspections to identify hazards and unsafe behavior
PP11	Supervisor lebih sering mengawasi pekerja yang melanggar beberapa aturan keselamatan
PP12	Supervisors are more likely to supervise workers who violate some safety rules
PP13	Supervisor makes sure we receive all the tools needed to do the job safely
Workmate's Influence	
IK1	We (my co-workers and I) who work here often remind each other about how to work safely
IK2	We (my co-workers and I) who work here speak out and encourage others to get involved in safety issues
IK3	We (my co-workers and I) who work here maintain a good working relationship with each other
IK4	We (my co-workers and I) who work here can communicate effectively with each other about safety (regardless of their background and age)
Supervisory Environment	
IK5	Regular safety talks take place in our workplace with our site manager present
IK6	Reports of safety hazards and incidents are welcomed and motivated by our site manager
IK7	To solve troublesome safety issues we always get support from our site manager
IK8	I view our site managers as role models in safety behavior (e.g. wearing personal protective equipment)
Worker's Involvement	
IK9	Every worker who works here together strives to achieve a high level of work safety
IK10	Every worker who works here reports safety accidents, incidents and potentially dangerous situations
IK11	If requested, every worker who works here is willing to participate in safety planning in accordance with our safety policy
IK12	If requested, every worker who works here is willing to take action to stop safety violations in order to protect the safety of co-workers
Competence	
IK13	Those of us who work here receive adequate training to do my job safely
IK14	We who work here fully understand the current and relevant laws
IK15	Those of us who work here are able to identify potentially dangerous situations
IK16	We who work here are able to use the relevant protective equipment
IK17	We who work here are proactive to eliminate safety hazards in the workplace
Worker Safety Behavior	
PKP1	I myself follow all safety procedures and use all necessary safety equipment to do the job
PKP2	My co-workers follow all safety procedures and use all necessary safety equipment to do the job
PKP3	I voluntarily perform tasks or activities that help improve workplace safety
PKP4	My co-workers volunteer to perform tasks or activities that help improve workplace safety

The research reported in this paper was undertaken in construction sites in Indonesia. This study uses a purposive sampling method. The sample in this study are construction workers who are involved in construction projects that implement safety management at construction sites. Data will be collected from different construction project sites in West Java, Central Java and Yogyakarta. Letters of request for permission explaining the purpose of this research to conduct field visits were distributed to contractors with various types of civil building projects and so on. Questionnaires will be given to construction workers face-to-face to ensure good quality of questionnaire data. In this study, the technique of combining interviews and questionnaires was used. Questionnaires are used to obtain respondents' perceptions of supervisory behavior that can affect worker safety behavior.

The data measurement scale is expressed in the form of an ordinal scale. To measure how often or the frequency of safety control practices that have been implemented in the company, a Likert scale of 1-5 is used with 1 = never practiced, 2 = rarely practiced, 3 = sometimes practiced, 4 = often practiced, and 5 = always practiced. To measure the safety climate, we still use a Likert scale of 1-5 with 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. Meanwhile, to measure worker safety behavior, they still use a Likert scale of 1-5 with 1 = never practiced, 2 = rarely practiced, 3 = sometimes practiced, 4 = often practiced, and 5 = always practiced.

IV. Result and Discussion

After 6 months of routine surveys a total of 150 questionnaires were received, of which 150 were valid surveys while 20 invalid ones were filled out incompletely. The contractors who responded with a positive attitude to participate in the survey were fifteen (78.95%) of whom were water construction contractors, three were road contractors (15.79%) and one was bridge contractor (5.26%). It can be concluded that the most respondents are respondents aged more than 35 years with a total of 116 people (77.33%). There are 70 people with equivalent junior high school education (46.60%). Has a position as Laden with a total of 86 people (57.33%). Having experience of 5-10 years as many as 72 people (48%). And the most types of projects carried out by respondents were 15-50 billion in the category of medium companies with a total of 76 people (50.67%).

4.1 Test Measurement Model

The test of this measurement model shows how the manifest variable is a valid indicator as a measure of the latent variable by testing the validity and reliability of the latent variable through an analytical technique called Confirmatory Factor Analysis (CFA). CFA is used to analyze convergent validity and discriminant validity through AMOS. According to previous research, convergent validity can be estimated through the value of factor loading (FL), construct reliability (CR) and Average Variance Extracted (AVE), an indicator shows significant convergent validity if the value of FL > 0.7, CR > 0.7 and AVE > 0.5 then the item is declared valid (Newaz et. al. 2019; Hair et. al. 2014). We can see in **Table 2.** the value of factor loading > 0.7, CR > 0.7 and AVE > 0.5, it can be concluded that the three variables have met convergent validity.

In this study, to measure discriminant validity, the AVE square root value was used, namely by comparing the value of the AVE square root and the correlation coefficient between latent variables. Fornell and Larcker 1981). In this study, we took the reference value of AVE from correlation comparison. Because AMOS does not display cross loading values. The AVE correlation value can be seen in **table 2**. In **table 1.**

Table 2. Discriminant validity test results

	Reactive & supportive action	Training & preventive action	Worker involvement	Supervisory environment	Competence	Workmate's influence	Worker Safety Behavior
Reactive & supportive action	1						
Training & preventive action	0.202	1					
Worker involvement	0.134	0.268	1				
Supervisory environment	0.231	0.532	0.517	1			
Competence	0.121	0.599	0.451	0.556	1		
Workmate's influence	0.139	0.312	0.477	0.589	0.366	1	
Worker Safety Behavior	0.210	0.492	0.541	0.681	0.630	0.942	1

Table 3. Factor Loadings of Supervisory Behavior and Safety Climate

Variabel	Indikator	Factor Loading (λ)	λ^2	AVE = rata-rata (λ^2)	CR = rata-rata (λ)
Training & preventive action	PP8	0.850	0.72	0.89	0.80
	PP7	0.880	0.78		
	PP6	0.948	0.90		
	PP5	0.909	0.83		
	PP4	0.826	0.68		
	PP3	0.870	0.76		
	PP2	0.922	0.85		
	PP1	0.937	0.88		
Reactive & supportive action	PP13	0.875	0.77	0.83	0.74
	PP12	0.944	0.89		
	PP11	0.963	0.93		
	PP10	0.945	0.89		
	PP9	0.846	0.20		
Supervisory environment	IK8	0.907	0.82	0.92	0.85
	IK7	0.929	0.86		
	IK6	0.930	0.86		
	IK5	0.931	0.87		
Workmate's influence	IK4	0.949	0.90	0.94	0.88
	IK3	0.948	0.90		
	IK2	0.948	0.90		
	IK1	0.916	0.84		
Worker involvement	IK12	0.998	1.00	0.96	0.91
	IK11	0.964	0.93		
	IK10	0.964	0.93		
	IK9	0.894	0.80		
Competence	IK17	0.997	0.99	0.95	0.90
	IK16	0.998	1.00		
	IK15	0.915	0.84		
	IK14	0.917	0.84		
	IK13	0.917	0.84		

4.2 Model Fitness Test

There are three categories of model fit, namely Absolute Fit (Chi-Square, RMSEA, GFI and AGFIA), Incremental Fit (TLI and CFI), and Parsimonious Fit (CMIN/DF). analysis *Goodness of Fitness* on the model in this study can be seen in Table 4.

Table 4. Test *Goodness of Fitness*

Category Fit Model	Criteria Index Size	Value Reference	Value	Description
Absolute fit	Chi-Square	Probability (P) > 0.05	0.000	Not Accepted
	RMSEA	0,8 – 1,0	0.098	Accepted
	GFI	0 – 1,00	0.731	Accepted
	AGFI	0 – 1,00	0.681	Accepted
Incremental fit	TLI	≥ 0,90	0.905	Accepted
	CFI	≥ 0,90	0.915	Accepted
Parsimony fit	CMIN/DF	≤ 3,00	2.417	Accepted

Source: AMOS 2022 Data Analysis.

Table 3 shows that of the seven indicators of the model's feasibility test, there are 6 that meet the requirements, namely CMIN/DF, RMSEA, GFI, TLI and CFI, while for Chi-Square it is not sufficient. Because testing the model's goodness is more likely to be significant, the researcher can conclude that the model is sufficient to meet its feasibility.

4.3 Structural model test

Evaluation of the structural model can also be done by testing the hypothesis by looking at the significance of the probability value as the basis for accepting or rejecting the null hypothesis. The significance value used is 5% or P < 0.05 (Hair et. al. 2014). Hypothesis testing in this study can be seen from the p-value in the AMOS output table in **Table 3.** below.

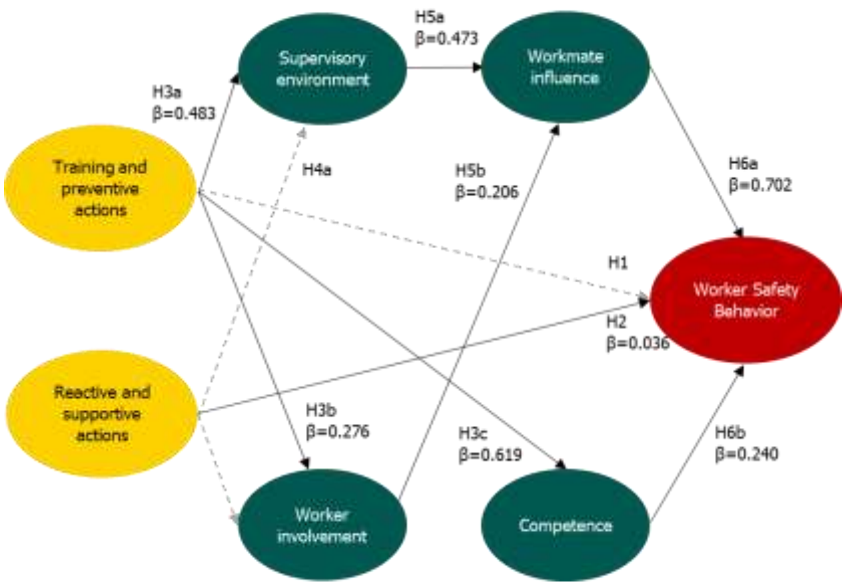

Figure 2. *The results of the hypothesis test of the research model*

Table 5. *Hypothesis Testing Result*

Hypothesis		Estimate	P-value	Result
H1	Training and preventive actions directly and positively affect worker safety behavior in construction projects	.044	0.099	No Significant
H2	Reactive and supportive actions directly and positively affect worker safety behavior in construction projects	.036	0.044	Significant
H3a	Training and preventive actions directly and positively affect the supervisory environment in project construction	.483	***	Significant
H3b	Training and preventive actions directly and positively affect worker involvement in project construction	.276	0.002	Significant
H3c	Training and preventive actions directly and positively affect worker competence in project construction	.619	***	Significant
H4a	Reactive and supportive actions directly and positively affect the supervisory environment in project construction	.102	0.067	No Significant
H4b	Reactive and supportive actions directly and positively affect worker involvement in project construction	.076	0.280	No Significant
H5a	Supervisory environment is positively related to the workmate influence in project construction	.473	***	Significant
H5b	Worker involvement is positively related to the influence of colleagues in project construction	.206	0.003	Significant
H6a	Workmate influence directly and positively affects the safety behavior of workers in project construction	.702	***	Significant
H6b	Competence directly and positively influences worker safety behavior in project construction	.240	***	Significant

Table 3 has carried out the comprehensive model feasibility test. The results state that the proposed model is accepted because it meets the feasibility index based on three categories of model fit. **Figure 3** shows the results of testing the research model hypothesis. Solid lines with *standardized effect coefficients* (β) represent significant relationships that pass the hypothesis test, while gray dotted lines represent insignificant

relationships that fail to pass the hypothesis test.

The results of hypothesis testing are clearly shown in **Table 5** and **Figure 3** Hypothesis 1 proposes that supervisor training and preventive measures have a positive and direct effect on worker safety behavior, but this study cannot validate this study (p = 0.099 > 0.05). Hypothesis 3 proposes that supervisor training and precautions positively and directly affect the dimensions of the safety climate, namely the supervisory environment (Hypothesis 3a), employee involvement (Hypothesis 3b), and competence (Hypothesis 3c). The results showed that Hypothesis 3a, namely training and preventive measures on the supervision environment, had a significant effect (p = 0.000 < 0.05).

Hypothesis 3b, namely training and preventive measures on job involvement, have a significant effect (p = 0.000 < 0.05). Hypothesis 3c is that training and preventive measures directly and positively affect the competence of workers in project construction(p = 0.000 < 0.05). Therefore, all hypotheses are accepted, which proves that the impact of training and supervisory precautions on the safety climate exists in construction projects.

Hypothesis 2 proposes that the reactive and supportive actions of supervisors affect worker safety behavior positively and directly, which can be validated by this study (p = 0.044 < 0.05). Hypothesis 4 states that supervisors' reactive and supportive actions positively and directly affect two dimensions of the safety climate, namely the supervisory environment (Hypothesis 4a) and employee involvement (Hypothesis 4b). The results of hypothesis testing in this study did not provide support for Hypothesis 4a (p = 0.067 > 0.05) and Hypothesis 4b (p = 0.280 > 0.05). Therefore, it can be concluded that reactive and supportive actions directly impact workers' safety behavior in construction projectsand no safety climate factor plays a significant mediating role in this relationship.

Hypothesis 5 proposes an internal association between safety climate dimensions: the supervisory environment positively affects co-workers (Hypothesis 5a), and employee involvement is also positively associated with co-workers (Hypothesis 5b). The results of the hypothesis test support both Hypothesis 5a (p = 0.000 <0.05) and Hypothesis 5b (p = 0.000 <0.05), so that Hypothesis 5 is well-validated.

Hypothesis 6 proposes that two dimensions of safety climate, namely the influence of co-workers (Hypothesis 6a) and competence (Hypothesis 6b), have a positive and direct effect on work safety behavior. Hypothesis 6a passed the hypothesis test (p = 0.000 < 0.05)and Hypothesis 6b passed the hypothesis test (p = 0.000 < 0.05). Thus, Hypothesis 6 is accepted, proving that the safety climate of construction projects positively affects worker safety behavior.

So, in essence, the direct and indirect effects of supervisory behavior on worker safety behavior are in construction projects. Training and preventive measures indirectly affect worker safety behavior, whereas reactive and supportive measures have a direct effect. Indirect effect means there is a mediating variable along the relationship. The effect of training and preventive measures on work safety behavior is mediated by four dimensions of the safety climate, namely (1) the supervisory environment, (2) employee involvement, (3) the influence of colleagues, and (4) competence.

4.4 Discussion

Overall, the research hypotheses reported in this study are pretty valid and have been proven to be significant. The main findings of this study are summarized and discussed as follows (β is the total effect value shown in **Table 6**):

Table 6. Total effect between different variables

Variables [a]	Training & preventive action	Reactive & supportif action	worker involvement	supervisory environment	Competence	workmate influence
worker involvement	0.276 [b]	----	----	----	----	----
supervisory environment	0.483 [b]	----	----	----	----	----
Competence	0.619 [b]	----	----	----	----	----
workmate influence	0.285 [c]	----	0.206 [b]	0.473 [b]	----	----
Worker Safety Behavior	0.393 [c]	0.036 [b]	0.145 [c]	0.332 [c]	0.240 [b]	0.702 [b]

a variable in the first row is the cause and the variable in the second row is the effect
b direct relationship

a. Effect of training and preventive action on worker safety behavior

Supervisor training and precautions have an indirect effect on worker safety behavior (β =0.393) which is mediated by four safety climate factors, namely (1) workmate influence (2) supervisory environment, (3) worker involvement, and (4) competence. Research shows that training and preventive measures have a role in influencing safety behavior through the mediation of safety. Therefore, strictly ensuring workers work safely even when tired or stressed and conducting safety training for workers in weekly talks or meetings can influence workers' behavior to work safely.

b. Effect of reactive and supportive actions action on worker safety behavior

Reactive and supportive actions from supervisors had a direct effect on worker safetybehavior (β = 0.036), while the direct effect of training and preventive measures on worker safety behavior was not successfully validated. This suggests that compared to training andinterpreting safety issues to workers, monitoring and control approaches such as ensuring workers receive all the equipment needed to do their jobs safely can directly impact workersafety behavior, even without improving the safety climate.

c. Effect of training and preventive action on worker safety behavior with safety climate as mediating variable

Training and preventive action have a direct effect on the supervisory environment (β = 0.483), worker involvement (β = 0.276) and competence (β = 0.619) of the safety climate. However, this study did not successfully validate the direct effects of reactive and supportive measures on the supervisory environment, worker involvement and competence. This implies that supervisors must provide adequate and constant proactive training, remind and warn workers to improve the project supervision climate, motivate workers' involvement in safety issues and increase workers' competence in doing work.

d. Effect of workmate influence on worker safety behavior

Co-workers' influence directly affects workers' safety behavior (β = 0.720), which means that mutual assistance significantly improves their safety behavior. This research provides theoretical for safety management best practices that encourage workers to pay attention to the safety of their co-workers and themselves. It also explains that workers pay more attention to the environment around them. When they sense danger and see unsafe behavior occurring on site, they must alert their co-workers of the dangerous situation and help them get out of harm's way instantly.

e. Effect of Competence on Work Safety Behavior

The influence of competence directly affects worker safety behavior ($\beta = 0.240$), indicating that safety has a significant relationship with competence and ability. Therefore, safety training should involve basic skills and techniques, safety awareness, and awareness.

V. Conclusion

Supervisory behavior is divided into two, namely (1) training and preventive measures and (2) reactive and supportive actions. Reactive and supportive actions have a very significant direct effect on worker safety behavior with a value ($\beta = 0.036$, $p < 0.05$). The indicator with the most significant value ($\lambda = 0.963$) of reactive and supportive actions that needs to be considered in influencing worker safety behavior is item PP 11 "Supervisors are more likely to supervise when a worker violates several safety rules." Supervisors become the focus because they have the direct and closest relationship with workers. Safety climate is determined as a mediator of supervisory behavior and safety climate. The detailed empirical relationship between supervisory behavior of project supervisors, safety climate and worker safety behavior in construction projects has been clarified through this study. The results show direct and indirect effects of supervisory behavior and safety climate on worker safety behavior. Supervisory behavior can, directly and indirectly, impact work safety behavior, and the safety climate mediates indirect impacts. The reactive and supportive actions of supervisors have an immediate and instant impact on worker safety behavior but have no impact on the safety climate.

In contrast, supervisory training and preventive measures have an indirect impact on worker safety behavior ($\beta = 0.393$), which is mediated by four safety climate factors, namely (1) worker involvement, (2) supervisory environment, (3) workmate influence and (4) competence. The most evident indicators of supervisory training behavior and preventive measures are item PP6 (Supervisors are very strict in working safely even when we are tired or stressed) with a factor loading = 0.948 and item PP1 "Supervisors conduct safety training for workers in talks or meetings weekly" factor loading = 0.937. While the most influential indicator of supervisory behavior for reactive and supportive supervisory actions is item PP 11 "Supervisors supervise more often when a worker violates several safety rules," with a factor loading = 0.963, and item PP10, "Supervisors conduct weekly inspections on site to identify hazards. and unsafe behavior" with a factor loading =0.945.

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