



Compliance of Scaffolder Workers in using Full Body Harness through Rewards and Punishment as Intervening Variable

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Abstract

In the context of occupational safety, compliance refers to the adherence to safety protocols designed to protect workers from various risks and hazards. A high level of compliance is crucial, particularly in high-risk sectors such as construction, where violations of safety procedures can lead to fatal accidents. This study aims to examine the extent to which scaffolding workers comply with the use of personal protective equipment (PPE), specifically the full body harness, through the application of rewards and punishments. A mixed methods approach was employed, combining quantitative analysis using SEM-PLS with qualitative insights obtained from interviews. The findings reveal that two variables had no statistically significant effect: compliance on the use of full body harness ($p\text{-value} = 0.992 > \alpha = 0.05$) and rewards on punishment ($p\text{-value} = 0.887 > \alpha = 0.05$). However, four variables showed statistically significant relationships: compliance on punishment, motivation on punishment, punishment on the use of full body harness, and rewards on the use of full body harness ($p\text{-value} < \alpha = 0.05$). Furthermore, all indirect relationships involving the use of PPE through punishment were found to be insignificant. These results suggest that companies should develop more comprehensive strategies, policies, and standard operating procedures (SOPs), and ensure consistent communication and socialization of safety practices across all operational activities.

Introduction

Law No. 1 of 1970 provides guidelines for workers to always prioritize occupational safety. Every worker has the right to protection while performing their duties, and such safety should also extend to others present in the workplace. In this context, compliance encompasses the observance of safety protocols aimed at minimizing occupational risks and hazards (Kohn et al., 2023; Vasilescu et al., 2021). A high level of compliance is particularly vital in hazardous work environments such as construction, where breaches in safety procedures can result in fatal accidents (Marhavilas et al., 2019; Osei-Asibey et al., 2023; Krishnasamy et al., 2025; Nyabioge et al., 2022; Cheema, 2023; Porter, 2021; Birhane et al., 2022).

Working at height refers to any work activity performed above ground or water surfaces involving a difference in elevation and a potential risk of falling, which could result in injury or death to the worker or others in the vicinity, as well as potential property damage (Ministry of Manpower Regulation No. 9/2016). Numerous safety challenges arise in such conditions, including workers neglecting to use PPE such as full body harnesses, failing to secure lanyards to handrails, or disregarding established procedures. According to the Work Safety and Health

Council, more than 126 incidents of workers falling from heights have been reported (Puspa Ningrum et al., 2023). Additionally, data from the Indonesian Social Security Administration Agency for Employment (BPJS Ketenagakerjaan) show that there were 265,334 occupational accidents reported from January to November 2022, marking a 13.26% increase from 234,270 cases in 2021 (Puspita et al., 2024).

Various preventive strategies have been implemented to minimize the risk of injury while working at height, including the use of elevated work techniques and scaffold systems. Scaffolding becomes essential particularly during prolonged work durations or when limited space restricts activity. Given the foundational role of safety in every job, mechanisms related to working at height such as fall prevention, PPE usage, and scaffolding must be emphasized. Furthermore, applying a system of rewards and punishments can reinforce worker compliance with safety protocols. Rewards play a critical role in shaping worker behavior, which may be influenced by intrinsic motivation or external encouragement from peers or superiors (Noviyanti et al., 2023). Conversely, punishment is expected to instill greater caution among workers and deter unsafe practices.

Methods

This study was conceptualized as a mixed method, where a combination of quantitative and qualitative methods was used to form a full image of the adherence of the scaffolder workers to wear full body harnesses. The selection of a mixed design was not coincidental as it was based on the fact that safety behavior is a multidimensional phenomenon. Numbers and statistical correlations may prove the existence of relations between compliance, motivation, rewards, punishment and the wearing of protective equipment but usually fail to indicate the rationale, the attitudes and the realities of life in the day to day. The qualitative aspect thus acted as a complement wherein the voices and understanding of their personal experiences by the workers were availed. These two strands were interwoven in the study not just to measure behavior but to know it in the practical and cultural sense.

The analysis was based on the quantitative part that was conducted with Structural Equation Modeling with Partial Least Squares (SEM-PLS). This approach was selected due to its ability to deal with relatively small sample sizes and yet be in a position to investigate intricate relationships among variables. Compared to the purely confirmatory techniques, SEM-PLS gives more emphasis on predictive power and this is particularly useful in exploring the relationship between various factors and how they might drive compliance. The reflective measurement model was used to make sure that each observed indicator was an accurate mirror of its latent construct. In order to ensure rigor, reliability and validity were critically discussed in the light of well-known standards related to Cronbachs alpha, composite reliability, Average Variance Extracted, and discriminant validation test. These measures enabled the study to go beyond superficial associations and be able to make findings with statistical confidence.

Meanwhile, the population and sampling strategy were considered carefully. Participants comprised of all 80 scaffolder workers who worked in PT X Batam City using a total sampling method. Both practical and theoretical considerations informed the decision to include the whole population. In practical terms, it was feasible in terms of the number of the working population and the need to consult all the workers minimized the chances of filtering out any opinions that otherwise would not be expressed. Theoretically, total sampling offered a more accurate representation of the organizational reality, which guaranteed that the patterns noticed are based on the lived experience of the entire population and not only a subset of it. The main instrument of the quantitative data collection was the structured questionnaires, whose items were well-adapted versions of the ones used in prior valid studies and were oriented to the particular work setting of scaffolding. Such equilibrium between procedure and contextuality served to generate data that were very plausible and informative.

To supplement these results, a qualitative strand was incorporated by use of in-depth, semi-structured interviews. Although the questionnaires only managed to get general trends in the survey, the interviews provided room to nuance and think so that the workers would express their reasons, frustrations, and opinions as to whether rewards and punishments play a significant role in influencing compliance. Purposive sampling was used to ensure that informants were different in terms of age, length of service and the degree of adherence, which made the difference in informants provide a range of insights. The semi-structured design created flexibility: a speaker-led group discussion made sure that discussions stayed on point, whereas, free discussion allowed spontaneous themes to emerge. By doing so, the qualitative inquiry both illuminated the statistical findings as well as illuminated that is difficult to reduce to numbers in terms of compliance behavior.

The analysis was conducted in an integrative but systematic manner. First, quantitative data was screened to determine completeness and accuracy and subjected to SmartPLS to examine both measurement and structural models. This measure verified the strength of the statistical associations. In the meantime, qualitative data were coded in a systematic manner, transcribed word-to-letter and analyzed thematically to identify common ideas and patterns. When the analysis of both the strands was carried out, the two results were reconciled through triangulation. Such an integration enabled the interpretation of numerical associations in the context of lived realities, and the positioning of the workers testimonies in the context of the greater whole of the model. Instead of assuming that the two approaches are distinct, the paper interwove the two approaches to create a more comprehensive and more plausible narrative.

Last but not the least, ethical considerations were not considered secondary in all the phases of the research. The participants were clearly told the objectives of the study, their voluntary participation in the research and the right to quit the study at any point without repercussions. The consent was taken in the form that focused on comprehension and willingness, and not only formality. In order to preserve confidentiality, all the answers were anonymized and presented only in the aggregate form. This ethical position did not only guarantee that the research did not infringe on scientific standards, but also on the dignity and trust of the workers who dedicated time and experiences.

Result and Discussion

Measurement Model Evaluation

The measurement model employed in this study adopts a reflective approach, wherein the constructs of compliance, motivation, rewards, punishment, and the use of full body harness are measured reflectively. According to Hair et al. (2021), the evaluation criteria for reflective measurement models include: outer loadings ≥ 0.70 , composite reliability ≥ 0.70 , Cronbach's alpha ≥ 0.70 , and Average Variance Extracted (AVE) ≥ 0.50 . Additionally, discriminant validity is assessed using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT), which should be below 0.90.

Table 1. Outer Loadings, Composite Reliability, and Average Variance Extracted

Variable	Item	Measurement Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Compliance	Kep 1	Understanding	0.910	0.810	0.813	0.840
	Kep 2	Awareness	0.923			
Motivation	Motiv 1	Recognition/Appreciation	0.784	0.834	0.836	0.668
	Motiv 3	Work Achievement	0.873			
	Motiv 4	Opportunity for Advancement	0.817			
	Motiv 5	Acknowledgment of Performance	0.791			

Reward	Reward 1	Financial Reward	0.978	0.958	0.962	0.959
	Reward 2	Non-financial Reward	0.981			
Punishment	Punish 1	Mild Punishment	0.854	0.782	0.820	0.689
	Punish 2	Moderate Punishment	0.819			
	Punish 3	Severe Punishment	0.817			
Use of PPE (Full Body Harness)	Use of PPE 1	In Accordance with Indications	0.829	0.771	0.837	0.959
	Use of PPE 2	Procedure Compliance	0.912			
	Use of PPE 3	Accuracy	0.732			

Based on the table above, the compliance variable is measured by two valid items with outer loadings ranging from 0.910 to 0.923, indicating that both indicators validly reflect worker compliance. The reliability level is acceptable, as shown by Cronbach's alpha and composite reliability values exceeding 0.810, indicating strong internal consistency. The convergent validity is also fulfilled, with an AVE of $0.840 > 0.50$, suggesting that 84.0% of the variance is explained by the indicators. Among the two, Kep2 (awareness) has the highest outer loading (0.923), signifying that awareness is the most dominant indicator of compliance at PT X. The motivation variable is measured by four valid items with outer loadings between 0.784 and 0.873, indicating appropriate representation of the construct. The reliability is acceptable (Cronbach's alpha and composite reliability > 0.834), and the AVE value of $0.668 > 0.50$ confirms good convergent validity, with 66.8% of the variance explained. Among them, Motiv3 (job achievement) has the highest outer loading (0.873), indicating it is the most influential motivational factor. The reward variable is assessed through two valid items with outer loadings of 0.978 and 0.981, both indicating very strong validity in capturing the reward construct. The reliability is high (Cronbach's alpha and composite reliability > 0.958), and AVE is also high at $0.959 > 0.50$, with 95.9% of the variance explained. Reward2 (non-financial reward) has the highest outer loading (0.981), indicating this form of reward is highly recognized at PT X. The punishment variable is measured by three valid items with outer loadings between 0.817 and 0.854. The reliability indicators exceed 0.782, and the AVE of 0.689 confirms good convergent validity, explaining 68.9% of the variance. Punish1 (light sanctions) has the highest loading (0.854), indicating its effectiveness in representing the punishment mechanism. The PPE Usage variable (Full Body Harness) is measured by three valid items with loadings ranging from 0.732 to 0.912.

Reliability is acceptable (Cronbach's alpha and composite reliability > 0.771), and the AVE of 0.959 shows excellent convergent validity. APD2 (according to procedure) has the highest outer loading (0.912), indicating that workers at PT X are using full body harnesses in accordance with standard procedures. Based on the table above regarding respondents' characteristics in terms of the husband's age, most respondents were 19 years old, with a frequency of 68 respondents (70%), followed by those aged 20 years with 26 respondents (27%), and 18 years with 3 respondents (3%). The age distribution of the participants falls within the category of healthy reproductive age. In terms of the wife's age, the majority of respondents' wives were 16 years old, comprising 43 respondents (44%), while 28 respondents (29%) were 17 years old, and 26 respondents (27%) were 18 years old. Regarding the occupation of the wives, most respondents were laborers, accounting for 44 respondents

(45.4%), followed by farmers with 27 respondents (27.8%), and traders with 26 respondents (26.8%).

Discriminant Validity Evaluation

Table 2. Fornell-Larcker Criterion

	Compliance	Motivation	Use of PPE	Punishment	Reward
Compliance	0.917				
Motivation	0.717	0.817			
Use of PPE	0.661	0.734	0.828		
Punishment	0.625	0.676	0.676	0.830	
Reward	0.659	0.746	0.896	0.548	0.979

Note: Diagonal values represent the square root of AVE; off-diagonal values represent inter-construct correlations.

Discriminant validity was assessed using the Fornell-Larcker criterion, which requires that the square root of the AVE of each construct be greater than its correlation with any other construct. The compliance variable has a square root of AVE (0.917), which is greater than its correlations with motivation (0.717), PPE usage (0.661), reward (0.659), and punishment (0.625), thereby confirming its discriminant validity. Similarly, the motivation variable (0.817) has higher AVE than its correlations with PPE usage (0.734), reward (0.746), and punishment (0.676). The PPE usage variable also meets this criterion with AVE (0.828) exceeding its correlation with punishment (0.676). The punishment variable (0.830) has greater AVE than its correlation with reward (0.548), thereby fulfilling discriminant validity requirements.

Table 3. HTMT Values

	Compliance	Motivation	Use of PPE	Punishment	Reward
Compliance					
Motivation	0.869				
Use of PPE	0.826	0.866			
Punishment	0.770	0.784	0.858		
Reward	0.746	0.817	0.888	0.602	

According to Hair et al. (2019), HTMT is a more sensitive and accurate method for assessing discriminant validity compared to traditional approaches. The recommended threshold for HTMT is below 0.90. The results in Table 1.3 show that all HTMT values are below the 0.90 threshold, confirming that discriminant validity is satisfactorily established. This suggests that each construct shares more variance with its respective indicators than with indicators of other constructs.

Structural Model Evaluation

Tabel 4. Inner VIF

Variable	Use of PPE (Full Body Harness)
Compliance	1.00
Motivation	1.00
Punishment	1.00
Reward	1.00

From table 4 above, it is found that the results of the inner VIF value <5 , which means that the level of multicollinearity between variables is low. These results reinforce that the parameter estimation results in SEM-PLS are robust (unbiased).

Table 5. Hypothesis Testing Results

Hypothesis	Hypothesis Statement	Path coefficients	P-value	95% Confidence Interval		F square	T statistics
				Lower	Upper		
H1	Compliance -> Use of Full Body Harness	0.001	0.992	-0.243	0.166	0.000	
H2	Compliance -> Punishment	0.284	0.043	-0.011	0.550	0.072	
H3	Motivation -> Punishment	0.458	0.002	0.144	0.738	0.148	
H4	Punishment -> Use of Full Body Harness	0.264	0.011	0.073	0.477	0.271	
H5	Reward -> Use of Full Body Harness	0.750	0.000	0.629	0.886	2.029	
H6	Reward -> Punishment	0.020	0.887	-0.252	0.291	0.000	
H7	Reward -> Punishment -> Use of Full Body Harness	0.005	0.896				0.896
H8	Compliance -> Punishment -> Use of Full Body Harness	0.075	0.190				0.190
H9	Motivation -> Punishment -> Use of Full Body Harness	0.121	0.069				0.069

Table 6. R Square

Variable	R-square	Adjusted R-square
Use of Full Body Harness	0.852	0.846
Punishment	0.498	0.478

Table 7. Standardized Root Mean Square Residual (SRMR)

Model Interpretation	SRMR
Model Fit	0.128

Table 8. Goodness of Fit (GoF) Index

Average Commuality	Average R-square	GoF Index
0.879	0.852	0.748

This research finding demonstrates intricate trends regarding the role of compliance, motivation, punishment, and reward in the use of Personal Protective equipment, in this case the Full Body Harness. Statistical analysis shows that compliance is not a direct factor in today use of PPE. The path coefficient has a value of 0.001 with p value of 0.992 and this clearly indicates that the changes in compliance behavior have no significant effect in changing the inclination of workers to make use of Full Body Harness. The effect is found within a ninety five percent confidence interval of minus 0.243 to plus 0.166 thus confirming the meaningless influence further. This result can be well understood through interviews. Employees have always cited that they are already aware of the need to wear PPE when working at height and their policies, training and Standard Operating Procedures have been supporting this understanding for some time. Correspondingly compliance does not exist, but instead is a background condition which is the norm. The study does indicate though that compliance exerts a large effect on punishment. The lapse in compliance path coefficient of 0.284 with the

p value of 0.043 validates the fact that lapses in compliance raise the chances of disciplinary actions. However, in reality, the workers usually uphold the standards of safety, so the punishment is hardly used. Adherence therefore helps in maintaining discipline at the workplace and not necessarily fashioning the use of PPE.

The factor of motivation is more active in defining the behavior of workers. The results show that an increase in motivation lowers the requirement of punishment greatly where the path coefficient of 0.458 and the p value of 0.002. Motivation can decrease punishment within the confidence interval to a maximum of 0.738. Motivation, in this meaning, is the internal push or push to do what one does with less influence by external pressure and more by internal belief. The earlier studies also highlight the fact that motivation may be conceptualized as an internal energy change that results in a meaningful action that is directed to the goal attainment (Noviyanti et al., 2023; Suci et al., 2021; Yu and Liu, 2024). The interviews prove that motivation at PT X is frequently developed by Safety Morning briefings where the safety is discussed as the responsibility of the entire group. Another finding of the study is that punishment positively influences the use of PPE significantly. The path coefficient = 0.264 and $p = 0.011$ indicates that disciplinary measures, as applied, support safe behavior. Notably, punishment does not serve as an intimidation approach but as a correction and education process that reminds workers of the significance of safety (Anwar and Teuku, 2016; Newman, 2017; Feinberg, 2019). Meanwhile, reward turns out to be the most powerful motivation of safe behavior. The path coefficient of 0.750 with p value of 0.000 and structural effect size of 2.029 indicates clearly that recognition; material and non material is decisive in maintenance of PPE compliance. Employees are glad to have their safe behavior rewarded, and this proves that reward is one of the strongest occupational safety reinforcers (Suci et al., 2021; Rogers and Schill, 2021).

Whilst these immediate effects are important, the research also examines the possibility of indirect effects via punishment as some form of intervening variable. The outcome indicates that the rewarding effect on punishment is not significant, path coefficient = 0.020 with a p-value of 0.887. In the same manner, the indirect effects of compliance, motivation and reward on PPE usage via punishment are all rejected since the p values are above the accepted limit. These results might seem to indicate that indirect relationships are not significant on the first glance. Nonetheless, interviews give a more elaborate description. According to workers, they always put on Full Body Harness not only due to punishment or reward, but due to the safety awareness which has already become a part of daily routine. This can be attributed to the fact that over time the culture of awareness was created due to prolonged training, information and safety campaigns (Notoatmodjo, 2015; Gyamfi et al., 2025; Boakye et al., 2022). Safety signage is used as a visual indicator to reinforce this culture as it acts as a reminder to the workers of possible hazards at all levels in their work. Statistically invisible indirect pathways occur in such an environment, since workers do not need extra external drivers to ensure safe behavior. The organization has been able to standardize safety to a normal level, making it a habit hence has not required punishment as a mediator.

Collectively, the results indicate the significance of an integrated approach to preventive and corrective measures of occupational safety management. One factor that accounts 85.2 percent of the variance in the use of PPE is punishment whereas the combined effect of compliance, motivation, and intervening variables among the other factors explains 49.8 percent of the variance. This contributes to the mixed picture that is validated by the model evaluation. The Standardized Root Mean Square Residual is of satisfactory fit, whereas the model estimation of 0.128 demonstrates weakness in the predictability. Nevertheless, the Goodness of Fit value of 0.748 qualifies the model as strong (Yamin, 2023). These findings indicate that the best way of doing it is to employ an integrated approach. Priorities should be made on rewards as it can provide the best power on behavior and punishment should be incorporated reasonably as an

educative aid and not as a form of control. The elements of compliance and motivation may not be visible in weight statistics, but it is critical in cultivating a culture of internalizing safety. With a sense of awareness integrated into everyday practice and strengthened through recognition and a balance of corrective action, organizations can guarantee that the use of PPE is a stable and predictable practice. The end-result is fewer occupational risks and a greater workplace safety culture.

Conclusion

There are four variables that exhibit a direct and significant influence, namely compliance and motivation on punishment, as well as punishment and reward on the use of Personal Protective Equipment (Full Body Harness). Conversely, the variables that demonstrate no significant effect are compliance on the use of PPE (Full Body Harness) and reward on punishment. Furthermore, with regard to indirect relationships, none of the variables show a significant indirect influence on the use of PPE (Full Body Harness) through punishment. In this context, it is imperative for the company to further develop comprehensive strategies, policies, and standard operating procedures (SOPs) that are consistently communicated and disseminated across all organizational activities.

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