

## EXPLORATION OF THE RELATIONSHIP BETWEEN INNOVATIVE BEHAVIOR AND SAFETY PERFORMANCE OF THE SEMARANG BASARNAS SAR TEAM

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**Abstract:** Safety performance in search and rescue institutions such as BASARNAS is very important but has not been widely researched in the Indonesian context. This study analyzes the relationship between safety leadership, safety training, innovative behavior, and safety performance at the BASARNAS Semarang Office. Using a quantitative approach, data was collected from 80 employees through an online questionnaire and analyzed with Structural Equation Modeling (SEM-PLS). The results show a significant beneficial influence of safety leadership and training on safety performance and innovative behavior. The main finding is the role of innovative behavior mediation in the relationship between safety leadership and safety performance. The study broadens the understanding of safety dynamics in the context of Indonesian public safety institutions, highlighting the importance of integrating innovation in safety management practices. Implications include leadership development that drives innovation and safety training design that stimulates creativity to improve overall safety performance.

**Keywords:** Safety leadership, Safety training, Innovative behavior, Safety performance

### INTRODUCTION

Public safety is the fundamental responsibility of the government in protecting its citizens from various threats and emergencies. In Indonesia, the National Search and Rescue Agency (BASARNAS) plays a vital role in maintaining public safety through various strategic efforts. These efforts include increasing operational capacity, developing a sophisticated early warning system, strengthening cross-sectoral coordination, and intensifying community education programs (Lisnawati et al., 2023; Widianingsih, 2023) Given the significance of the role of BASARNAS, the safety performance of this institution is a crucial factor in ensuring the effectiveness of

public services and public safety comprehensively.

BASARNAS Semarang City, as one of the strategic operational offices, bears a great responsibility in handling search and rescue operations in the Central Java region. The region's diverse geographical characteristics, including coastal, mountainous, and urban areas, present unique challenges for BASARNAS Semarang in carrying out its duties. This complexity demands a high level of safety performance, not only to guarantee the safety of the SAR team itself but also to ensure the effectiveness of the overall rescue operation.

Empirical phenomena observed in the field show that the safety performance of BASARNAS Semarang is influenced by various interrelated factors. Initial observations indicate variations in the level of compliance with safety procedures, the frequency of safety incidents, and the effectiveness of responses in emergency situations. This raises questions about the factors that contribute to such variations and how they can be optimized to improve overall safety performance.

In this context, the three main concepts that are relevant to analyze are safety leadership, safety training, and innovative behavior. Safety leadership refers to the leader's commitment and actions in creating and maintaining a positive safety culture, as well as involving team members in safety-related decision-making (Gill & Nazim, 2023). Safety training involves systematic efforts to increase team members' knowledge, skills, and awareness of critical safety aspects in SAR operations (Cattleya & Anissa, 2023). Meanwhile, innovative behavior in the context of safety refers to the initiative of team members in generating, introducing, and implementing new ideas to improve safety practices in the field (Hansez & Chmiel, 2010).

Safety performance, as a dependent variable in this study, is a comprehensive measure that reflects the effectiveness of organizations in managing and maintaining safety in the workplace. The concept includes various indicators such as accident rates, the number of working days lost due to safety incidents, and the level of compliance with established safety procedures. In the context of BASARNAS Semarang, safety performance has two important dimensions: first, protecting personnel during high-risk operations, and second, ensuring the safety of people who need help in emergency situations.

The current literature shows that safety leadership plays a critical role in creating a safe and productive work environment (Miño-Terrance et al., 2023). Effective leaders in the safety aspect not only set priorities and provide feedback, but also lead by example in implementing safety procedures. This contributes significantly to the development of a strong safety culture within the organization. Recent research by (Gill & Nazim, 2023) revealed the positive impact of safety leadership on safety citizenship behavior, although they also noted potential civic fatigue as a side effect to watch out for.

Safety training, as the second key element, has proven to be a vital aspect in improving team members' competencies to identify, evaluate, and control hazards in a dynamic work environment. The effectiveness of this training is influenced by a variety of factors, including delivery methods, participant engagement levels, and the relevance of the content to BASARNAS' specific work context. (Mariani et al., 2022) suggest that training methods that involve active participation, as measured by the Safety Training Engagement Scale (STE), can significantly increase team member dedication and absorption of safety materials. Further (Barati Jozan et al., 2023) highlighting the effectiveness of online-based occupational safety and health training in improving workers' knowledge and abilities, as well as reducing the incidence of injuries and accidents in the field.

Innovative behavior in the context of occupational safety, as the third variable analyzed, is defined as the actions of team members who proactively introduce, develop, and implement new ideas to improve workplace safety practices (Fatih, 2022). In organizations such as BASARNAS Semarang, innovative behavior can involve developing new, safer rescue techniques, improving existing safety protocols, or creating a more efficient hazard reporting system (Wati et al., 2023). Factors that influence this innovative behavior include psychological safety within the team, an organizational culture that supports creativity, and a positive innovation climate (Elsayed et al., 2023).

Although previous research has explored the relationship between these variables separately, there is still a significant gap in understanding how these factors interact in the specific context of rescue organizations such as BASARNAS Semarang. This gap research is becoming

increasingly relevant given the unique characteristics of SAR operations in Indonesia, which involve geographical complexity, diversity of risks, and specific logistical challenges. The novelty of this study lies in the integration of these three variables in the context of SAR operations in Indonesia, which has never been explored before.

To fill this research gap, this study presents innovative behavior as a potential intervening variable in the relationship between safety leadership, safety training, and safety performance. This approach is based on the idea that effective leadership and appropriate training can encourage innovative behaviors among team members, which in turn can improve overall safety performance. (Zhou et al., 2023) found that innovative behaviors contribute positively to an organization's safety performance, with employees engaging in innovative behaviors tending to be more proactive in identifying and addressing safety risks. Meanwhile, (Korshuno et al., 2023) emphasizes the importance of integrating problem-solving skills in safety training to stimulate employees' innovative behaviors.

This research was conducted at the BASARNAS Semarang Office, which has operational responsibility for the Central Java region. The selection of this locus was based on strategic considerations given the geographical and demographic complexity of the region, which includes coastal, mountainous, and urban areas. This condition provides an ideal context for exploring the dynamics of safety leadership, safety training, innovative behavior, and safety performance in diverse and challenging situations.

This study uses a quantitative approach with a cross-sectional design. Data will be collected through a structured survey distributed to members of the SEMARANG BASARNAS SAR team. Data analysis will involve inferential statistical techniques, including path analysis and structural equation modeling (SEM), to test the relationships between variables and mediation effects.

Based on a review of the literature and identified research gaps, this study proposes the following hypothesis: H1: Safety leadership has a positive effect on the innovative behavior of the BASARNAS Semarang SAR team. H2: Safety training has a positive effect on the innovative behavior of the SAR BASARNAS Semarang team. H3: Innovative behavior has a positive effect on the safety performance of the BASARNAS Semarang SAR team. H4: Innovative behavior mediates the relationship between safety leadership and safety performance. H5: Innovative behavior mediates the relationship between safety training and safety performance.

This research focuses on improving the safety performance of BASARNAS Semarang through the optimization of three key elements: safety leadership, safety training, and innovative behavior. This study aims to uncover the complex interaction between these three factors in the context of the SAR team's operations. Specifically, this study will analyze how safety leadership influences the innovative behavior of team members, as well as evaluate the impact of safety training on creativity in safety practices.

Furthermore, this study will examine the relationship between innovative behavior and improved overall safety performance. Another crucial aspect is the investigation of the mediating role of innovative behavior—both in the relationship between safety leadership and safety performance, as well as between safety training and safety performance. Through this multidimensional exploration, the research aims to provide valuable insights to build a SAR team that is not only safe, but also innovative and adaptive to evolving safety challenges.

The results of this study are expected to provide valuable insights for BASARNAS Semarang in formulating a more effective safety improvement strategy. Practical implications of these findings could include improving safety training programs, developing leadership styles that are more supportive of innovation in safety aspects, and implementing mechanisms that encourage innovative behavior among SAR team members.

## METHODS

This study uses a quantitative approach with a cross-sectional design, to investigate the relationship between variables at one point in time (Setia, 2016). The research population is all employees of the BASARNAS Semarang Office, totaling 80 people. The sampling technique used is saturated sampling, where all members of the population are used as research samples (Etikan, 2016). This method was chosen because of the relatively small size of the population and to maximize the representation of the entire workforce.

Primary data was collected through an online questionnaire distributed using Google Forms, considering efficiency and ease of access for respondents (Regmi et al., 2017). The questionnaire consists of four main sections that measure the research variables: Safety leadership, measured using a scale developed by (Wu et al., 2008); Safety training, adapting instruments from (C. S. Burke et al., 2006); Innovative behavior, using the scale of (Janssen, 2000); Safety performance, measured by instruments developed by (Neal et al., 2000). Each statement item in the questionnaire is measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), which has been shown to be effective in organizational behavior research (Harpe, 2015). Before distribution, the questionnaire was tested for validity and reliability through a pilot study on a small sample of employees ( $n = 30$ ) that were not included in the main sample of the study (Connelly, 2009). The validity of the content is assessed by a panel of experts in the field of occupational safety, while the validity of the construct is evaluated using exploratory factor analysis. Reliability was tested using Cronbach's alpha coefficient, with the minimum acceptable value set at 0.70 (Taber, 2018). The results of this test are used to improve research instruments.

To ensure a high response rate, the researcher applied a follow-up strategy via email and phone to respondents who had not completed the questionnaire, with appropriate time intervals to avoid respondent fatigue (Saleh & Bista, 2017). The data was analyzed using Structural Equation Modeling (SEM) with the Partial Least Squares (PLS) approach through SmartPLS 3.0 software. The selection of PLS-SEM is based on its ability to handle relatively small sample sizes and model complexity (Hair et al., 2019).

The analysis includes the evaluation of the measurement model (outer model) and the structural model (inner model). The evaluation of the measurement model included composite reliability tests, convergent validity (Average Variance Extracted  $> 0.5$ ), and discriminatory validity using Fornell-Larcker criteria and Heterotrait-Monotrait ratio (HTMT) (Hair et al., 2019). The structural model is evaluated through the coefficient of determination ( $R^2$ ), effect size ( $f^2$ ), and predictive relevance ( $Q^2$ ) (Shmueli et al., 2019). The bootstrapping method with 5000 resamples is used to test the hypothesis, according to the recommendations (Hair et al., 2019). The significance level was set at  $p < 0.05$ . In addition, an indirect effects analysis was also conducted to test the role of innovative behavioral mediation in the relationship between safety leadership and safety training on safety performance, using the procedure proposed by (Zhao et al., 2010). To overcome the potential for common method bias, this study applies procedural and statistical remedies (Podsakoff et al., 2012). Procedurally, the questionnaire was designed by separating the measurement of predictor variables and criteria, as well as ensuring the anonymity of the respondents. Statistically, Harman's single-factor test and the variable marker approach were used to assess the level of common method variance.

## **FINDING AND DISCUSSIONS**

### **Respondent characteristics**

The characteristics of the respondents showed a diverse demographic distribution in BASARNAS Semarang. Most employees (46.2%) are in the age range of 31-40 years, with male gender dominance (77.5%). The educational background is dominated by undergraduate graduates who demonstrate an adequate level of qualification. The work experience is evenly distributed, showing a balance between senior and junior employees. All personnel have undergone basic safety training, with most having attended advanced training. This composition reflects a workforce dominated by productive middle-aged individuals with good levels of education and diverse experiences. These characteristics support the implementation of effective safety programs and can encourage innovative behavior in the context of occupational safety at BASARNAS Semarang.

**Table 1. Characteristics of Respondents**

Variable	Sum	%	Variable	Sum	%
<b>Gender</b>			<b>Working Period (Years)</b>		
Man	62	77,5%	1 to 5	16	20%
Woman	18	22,5%	6 to 10	26	32,5%
			11 to 15	27	33,75%
			16 and above	11	13,75%
<b>Age</b>			<b>Academic Level</b>		
21 - 30	16	20%	SMA	20	25%
31 - 40	37	46,2%	Diploma	13	16,25%
41 - 50	19	23,8%	Bachelor	41	51,25%
Above 50	8	10%	Master	6	7,5%

**Outer Model Test**

Convergent validity and reliability analysis was carried out to evaluate the quality of the measurement instruments used in this study. This analysis includes measurements of loading factors, Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's Alpha for each construction. Table 1 presents a summary of the results of the analysis, which will be discussed in detail in the following paragraphs.

**Table 2: Loading Factor, AVE, Composite Reliability and Cronbach's Alpha**

Variable	Indicators	Items	Loading factors	AVE	Composite reliability	Cronbach Alpha
Safety Leadership	Management Commitment to Safety	KK1	0.790	0.615	0.865	0.795
	Safety Communication	KK2	0.805			
	Increased Security	KK3	0.745			
	Safety Policy	KK4	0.797			
Safety training	Safety Training Provided	PK1	0.731	0.624	0.869	0.799
	Quality of Training	HP2	0.807			
	Training Experience	PK3	0.794			
	Effectiveness of Safety Training	PK4	0.826			
Innovative behavior	Creativity in Identifying Potential Hazards	PI1	0.806	0.654	0.883	0.823
	Proposed Safety Improvements	PI2	0.757			
	Participation in Safety Programs	PI3	0.847			
	Safety Initiatives	PI4	0.821			
Safety performance	Safety Compliance	KKS1	0.851	0.673	0.891	0.837
	Safety Engagement	KKS2	0.879			
	Injury Rate	KKS3	0.786			
	Preventable Accident Rate	KKS4	0.759			

The loading factor is valid if the value is > 0.6; An AVE is valid if the value is > 0.5. Composite reliability is valid if the value is > 0.7; Cronbach Alpha is valid if the value is > 0.6.

The results of the analysis show convergent validity and excellent reliability for all measurement instruments. The loading factor of all indicators was above the threshold of 0.7 (range 0.731-0.879), and the Average Variance Extracted (AVE) value for all constructions exceeded 0.5 (range 0.615-0.673), meeting the criteria of convergent validity (Hair et al., 2011). Reliability proved to be excellent, with Composite Reliability (CR) and Cronbach Alpha values exceeding 0.7 for all constructions. The CR value ranges from 0.865 to 0.891, while the Alpha Cronbach ranges from 0.795 to 0.837. Per-construction analysis showed consistent psychometric traits: Safety Leadership (AVE=0.615, CR=0.865,  $\alpha$ =0.795), Safety Training (AVE=0.624, CR=0.869,  $\alpha$ =0.799), Innovative Behavior (AVE=0.654, CR=0.883,  $\alpha$ =0.823), and Safety Performance (AVE=0.673, CR=0.891,  $\alpha$ =0.837). These results confirm the strong validity and reliability of each of the constructions in this study.

**Table 3: Heterotrait-Monotrait Ratio (HTMT) Assessment**

Variable	Safety leadership	Safety performance	Innovative behavior	Safety training
Safety leadership				
Safety performance	0.745			
Innovative behavior	0.691	0.657		
Safety training	0.842	0.825	0.750	

The analysis of the validity of discrimination using the Heterotrait-Monotrait Ratio (HTMT) method showed satisfactory results. All HTMT values are below the 0.9 threshold, meeting the criteria for discrimination validity (Henseler et al., 2016). The strongest correlation was found between Safety training and Safety leadership (0.842), followed by Safety training and Safety performance (0.825) and innovative behavior and Safety training (0.750). The lowest but still significant correlation was between Safety leadership and safety performance (0.745). These results suggest that although there is a strong relationship between constructions, each construction is still unique enough to be considered a separate variable in the research model.

### Inner Model Test

To evaluate the predictive power of the research model, an analysis of the determination coefficient ( $R^2$ ) and predictive relevance ( $Q^2$ ) was carried out. This analysis aims to measure the extent to which independent variables can explain the variation of dependent variables and assess the predictive power of the model. The following table presents the results of the  $R^2$ , Adjusted  $R^2$ , and  $Q^2$  analyses for the Safety Performance (Z) and Innovative Behavior (Y) variables.

**Table 4: R Square, R Square Adjusted, Predictive Relevance**

	Coefficient of Determination		Predictive Relevance ( $Q^2$ )
	R Square ( $R^2$ )	R Square Adjusted	$Q^2$ Value
Safety performance	0.532	0.514	0.324
Innovative behavior	0.566	0.555	0.298

The analysis of the structural model shows good explanatory and predictive power. The coefficient of determination ( $R^2$ ) for Safety Performance is 0.532, indicating that Predictors in the model can explain 53.2% of the variation. According to the criteria, this value close to substantial category (Chin, 1998). For Innovative Behavior,  $R^2$  0.566 indicates a moderate level explanation. The predictive relevance ( $Q^2$ ) for the Safety Performance variable was 0.324 and for the Innovative Behavior variable was 0.298, indicating a good predictive power model (Hair et al., 2019). These values are in the medium predictive relevance range, According to (Henseler et al., 2009). Overall, these results support the validity and usability of the model in explaining and predicting Safety Performance and Innovative Behavior.

### Conformity Rating (GoF Index)

Evaluation of the overall model validation using the Goodness of Fit (GoF) index showed excellent performance. A  $Q^2$  value of 0.822 was calculated based on Safety Performance  $R^2$  (0.532) and Innovative Behavior (0.566), indicating that the model can account for 82.2% of the data diversity. See criteria (Wetzels et al., 2009), where a GoF value of  $> 0.36$  is considered high, this result shows that the model is a perfect fit. According to (Geisser, 1974; Stone, 1974), the  $Q^2$  value is well above 0 confirming the model's predictive solid relevance. Nonetheless, the 17.8% unexplained variation suggests that there is room for further research to identify possible additional factors which plays a role in the phenomenon being studied.

### Hypothesis Testing

The pathway analysis in this study aims to uncover the relationship between safety leadership, safety training, innovative behavior, and safety performance. Through hypothesis testing with the SEM-PLS method, this study explores the direct and indirect effects between variables. The results of the analysis provide valuable insights into the dynamics of occupational safety and innovation in the context of the organization. Here is a breakdown of the key findings:

**Table 5: Results of Hypothesis Testing  
through Path Coefficient Bootstrapping Technique**

Path	Beta	Standard Deviation	T Statistics	P Values	Information
Direct Influence					
Safety leadership → Safety performance	0.229	0.116	1.978	0.048	Accepted
Safety leadership → Innovative behavior	0.533	0.099	5.380	0.000	Accepted
Safety training → Safety performance	0.168	0.140	1.198	0.231	Not accepted
Safety training → Innovative behavior	0.311	0.088	3.538	0.000	Accepted
Innovative behaviour → Safety performance	0.427	0.128	3.351	0.001	Accepted
Indirect influence					
Safety leadership → Innovative behaviour → Safety performance	0.228	0.081	2.819	0.005	Accepted
Safety training → Innovative behavior → Safety performance	0.133	0.058	2.300	0.022	Accepted

The pathway analysis revealed some significant findings. Safety leadership had a significant direct influence on safety performance ( $\beta = 0.229$ ,  $p = 0.048$ ) and innovative behavior ( $\beta = 0.533$ ,  $p < 0.001$ ). Safety training had no significant direct effect on safety performance ( $\beta = 0.168$ ,  $p = 0.231$ ), but had a significant direct influence on innovative behavior ( $\beta = 0.311$ ,  $p < 0.001$ ). Innovative behavior was also shown to have a significant direct influence on safety performance ( $\beta = 0.427$ ,  $p = 0.001$ ). In addition, there was a significant indirect influence of safety leadership on safety performance through innovative behavior ( $\beta = 0.228$ ,  $p = 0.005$ ). Similarly, safety training had a significant indirect influence on safety performance through innovative behavior ( $\beta = 0.133$ ,  $p = 0.022$ ). Overall, these results suggest that safety leadership and safety training have an important role to play in promoting innovative behaviors, which in turn contributes to improved safety performance. Although safety training does not have a significant direct influence on safety performance, its influence on safety performance is mediated by innovative behavior.

## DISCUSSION

This study examines the relationship between safety leadership, safety training, innovative behavior, and safety performance in the context of organizations. The results of the analysis show that the proposed model has good explanatory and predictive power, with a coefficient of determination ( $R^2$ ) for Safety Performance of 0.532 and Innovative Behavior of 0.566. These values indicate that the model can account for more than half of the variation in both dependent variables, according to (Chin, 1998) approaching a substantial level for organizational behavior research. Predictive relevance ( $Q^2$ ) for both variables also demonstrated the model's good predictive power, with a value of 0.324 for Safety Performance and 0.298 for Innovative Behavior, confirming the validity and usability of the model in the context studied (Hair et al., 2019).

The main finding of this study is the significant influence of safety leadership on safety performance, both directly and indirectly through innovative behavior. The significant direct influence of safety leadership on safety performance ( $\beta = 0.229$ ,  $p = 0.048$ ) emphasizes the importance of the role of leaders in creating a safe work environment. These results are consistent with (Clarke, 2013), which found that safety leadership has a positive impact on employee safety behavior and organizational safety outcomes.

Furthermore, the influence of safety leadership on innovative behavior ( $\beta = 0.533$ ,  $p < 0.001$ ) shows that leaders who prioritize safety are also more likely to drive innovation in the workplace. These findings expand our understanding of the role of safety leadership, in line with the (Martínez-Córcoles et al., 2011) that safety leadership can create a climate that supports creativity and innovative problem-solving in the context of safety.

Interestingly, safety training did not show a significant direct effect on safety performance ( $\beta = 0.168$ ,  $p = 0.231$ ). These results appear to contradict some previous studies, such as a meta-analysis conducted by (Ricci et al., 2016), which found a positive association between safety training and safety outcomes. However, these findings reflect the complexity of the influence of safety training, which may not always have a direct impact on safety performance but operates

through other mechanisms. This is supported by the significant indirect influence of safety training on safety performance through innovative behaviors ( $\beta = 0.133$ ,  $p = 0.022$ ). These findings suggest that safety training may be more effective in improving safety performance when it successfully encourages innovative behaviors among employees, in line with the argument (Noe et al., 2014) about the importance of training transfer and creative application of knowledge in the context of work.

The role of innovative behavior mediation in the relationship between safety leadership, safety training, and safety performance is an important contribution of this research. Strong direct influence of innovative behaviour on safety performance ( $\beta = 0.427$ ,  $p = 0.001$ ) indicates that employees who exhibit innovative behavior tend to contribute to improved organizational safety performance. These results expand on the findings (Probst et al., 2013), which found that employee innovation can contribute to better safety solutions and improved safety in the workplace. Further, the significant mediating effect of innovative behavior in the relationship between safety leadership and safety performance ( $\beta = 0.228$ ,  $p = 0.005$ ) as well as between safety training and safety performance ( $\beta = 0.133$ ,  $p = 0.022$ ) highlights the importance of encouraging innovation as a mechanism to improve safety.

These findings have important theoretical implications. This research expands on existing safety leadership models (Zohar, 2003) by integrating innovative behavior as a key mediating variable. This provides new insights into the occupational safety and innovation literature of organizations, demonstrating that efforts to improve safety and encourage innovation can complement and reinforce each other. The proposed model also expands the theory of social exchange (Blau, 2017) In the context of occupational safety, it shows that safety leadership and safety training can be seen as an organizational investment that encourages employees to respond not only with better safety behaviors, but also with innovative contributions to safety.

In practical terms, the results of this study suggest that organizations should consider a holistic approach to safety management that focuses not only on safety leadership and training, but also on creating an environment that encourages innovative behavior. Managers and team leaders must be trained not only in safety practices, but also in ways to encourage and facilitate innovation among their employees. Safety training programs should be redesigned to include elements that encourage creative thinking and innovative problem-solving in a safety context, in line with recommendations (M. J. Burke et al., 2011) about effective safety training.

Although the research model shows good explanatory power, it should be noted that there are still unexplained variations in safety performance and innovative behavior. The Goodness of Fit (GoF) Index of 0.822 indicates an excellent model fit according to the criteria (Wetzels et al., 2009), but also indicates that there are other factors that contribute to the phenomenon studied. This opens up opportunities for further research that can explore additional variables or alternative mechanisms that may influence safety performance and innovative behavior in an organizational context.

## CONCLUSION

This research successfully answers the question of the relationship between safety leadership, safety training, innovative behavior, and safety performance in the context of organizations. The results show that safety leadership has a significant positive influence on safety performance, both directly and indirectly through innovative behaviors. Safety training, while not having a significant direct influence on safety performance, influences safety performance indirectly through innovative behavior.

The research hypothesis that there is a positive relationship between safety leadership and safety performance is proven to be supported. Similarly, the hypothesis about the role of innovative behavior mediation in the relationship between safety leadership and safety performance, as well as between safety training and safety performance, is also proven. However, the hypothesis that there is a direct influence of safety training on safety performance is not supported by data.

These findings extend the existing safety leadership model by integrating innovative behavior as a key mediating variable. This provides new insights into the occupational safety and innovation literature of organizations, demonstrating that efforts to improve safety and encourage innovation can complement and reinforce each other. The proposed model also

expands the theory of social exchange in the context of occupational safety, suggesting that safety leadership and safety training can be seen as an organizational investment that encourages employees to respond not only with better safety behaviors, but also with innovative contributions to safety.

Managerially, the results of this study suggest that organizations should adopt a holistic approach to safety management. This involves not only focusing on leadership and safety training, but also on creating an environment that encourages innovative behaviors. Managers and team leaders must be trained in safety practices and ways to encourage innovation among employees. Safety training programs need to be redesigned to include elements that encourage creative thinking and innovative problem-solving in the context of safety.

This research has several limitations. Cross-sectional design limits the ability to draw causal conclusions. The use of self-report data can pose a risk of bias in general methods. In addition, the study was conducted in the context of a specific organization, which may limit the generalization of the findings to other organizational settings.

Based on these findings and limitations, several recommendations for future research can be identified:

1. Conduct longitudinal studies to confirm causal relationships between the variables studied.
2. Exploring contextual factors that may moderate the relationship between research variables, such as organizational climate or industry characteristics.
3. Further investigate the psychological mechanisms underlying the relationship between safety training and innovative behavior.
4. Using objective data sources or multi-source assessments to strengthen the validity of findings and reduce the potential bias of common methods.
5. Expand research to different types of organizations and industries to improve the generalization of findings.

In conclusion, this research contributes significantly to our understanding of the dynamics of occupational safety and innovation in organizations. By highlighting the important role of innovative behavior as a mediator between safety management practices and safety performance, this study encourages a more integrated approach to safety management. These findings pave the way for the development of more effective and holistic safety management strategies, which can improve both safety and innovation in organizations.

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