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Determinants of Unsafe Work Behaviors among Outsourced Workers: A Cross-Sectional Study at a PT Madubaru Yogyakarta, Indonesia

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Abstract: Unsafe work behaviors remain a major contributor to occupational accidents in high-risk industrial settings, particularly among outsourced workers who often face limited safety training and weaker organizational attachment. The sugar manufacturing industry involves complex mechanical processes that increase the potential for unsafe actions during daily operations. This study aimed to analyze factors associated with unsafe work behaviors among outsourced workers at a sugar manufacturing facility in Indonesia.
This study employed an analytical survey with a cross-sectional design. The research was conducted at the milling station of a sugar manufacturing facility in Yogyakarta. The study population consisted of outsourced workers directly involved in the production process, and all eligible workers were included using a total sampling technique. Data were collected using structured questionnaires that measured attitudes toward safety, work competence, effectiveness of safety procedures, personal protective equipment policies, and unsafe work behaviors. Data were analyzed using univariate, bivariate, and multivariate statistical analyses.
The results show that unsafe work behaviors are present among a considerable proportion of outsourced workers. Attitudes toward safety, work competence, effectiveness of safety procedures, and personal protective equipment policies are significantly associated with unsafe work behaviors. Workers with poor work competence show the highest prevalence of unsafe behaviors compared to those with adequate competence.
In conclusion, unsafe work behaviors among outsourced workers are influenced by both individual and organizational factors. Strengthening worker competence, improving safety attitudes, ensuring effective safety procedures, and enforcing personal protective equipment policies are essential to reduce unsafe behaviors and enhance occupational safety in high-risk industrial environments.

Keywords: Unsafe acts; Outsourcing workers; Occupational health and safety; Work competence; Safety procedures; Personal protective equipment

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Introduction

Occupational safety and health (OSH) is still a crucial issue in the manufacturing industry sector, especially in high-risk industries such as sugar processing. International reports show that most work accidents in the industrial sector are caused not only by unsafe working conditions, but also by unsafe work behaviors or unsafe acts. (Nakhal A *et al*., 2021). Previous studies have confirmed that more than 70% of work accidents are directly related to unsafe actions of workers, such as not wearing personal protective equipment, ignoring work procedures, and performing risky actions in hazardous work

areas (Yue *et al*., 2022). These findings are reinforced by other studies that state that unsafe behavior is a dominant factor compared to technical factors in triggering work incidents, especially in industrial environments with exposure to high-risk machinery and production processes (Fan) *et al.*, 2023).

In the context of modern employment, the increasing use of outsourced labor is a global phenomenon, including in developing countries (Zara) *et al*., 2023). Outsourced workers generally face different working conditions than permanent workers, such as limited OHS training, weak organizational attachments, and inconsistent levels of supervision (Wibowo *et al*., 2023). Several international studies show that outsourced workers have a higher risk of workplace accidents than permanent workers due to low risk perception and adherence to safety procedures (Shan) *et al.*, 2022; Winarno *et al*., 2024). On the other hand, other studies emphasize that outsourced work status is often associated with job uncertainty and psychosocial stress, which can indirectly affect workplace safety behavior. However, there are also research results that indicate that organizational factors, such as management commitment and safety culture, can moderate the risk of unsafe actions in outsourcing workers. These differences in findings suggest that the relationship between outsourcing status and unsafe acts is still complex and contextual (Ryza) *et al.*, 2024).

Previous research on unsafe actions has largely focused on permanent workers or specific industrial sectors, such as construction and mining, with approaches that emphasize purely individual factors, such as knowledge, attitudes, and work experience (Andwina *et al.*, 2025; Ukponmwan & Onosemuode, 2025; Utama, 2020). Meanwhile, studies that integrate individual factors and organizational factors simultaneously on outsourced workers in the manufacturing industry sector are still relatively limited, especially in developing countries. In addition, some studies use longitudinal or experimental research designs that are difficult to apply in an industrial environment with operational limitations, so an alternative approach is needed that is still able to provide a comprehensive picture of the relationship between variables through the design of cross-sectional analytical surveys (Hester & Fusch, 2020).

In Indonesia, the sugar industry is one of the manufacturing sectors that has high work risk characteristics due to the use of heavy machinery, high-speed milling systems, and exposure to noise and dust. Although OHS regulations have been implemented nationwide, the company's internal reports and field findings show that unsafe practices are still common, especially among outsourced workers who are directly involved in the production process (Phiri *et al*., 2025). Several previous national studies have identified factors related to *Unsafe Acts*, but are still generally descriptive, limited to one dominant factor, and have not specifically placed outsourced workers as a risk group that requires special attention. This condition shows that there is a gap between the complexity of the problem in the field and the research approach that has been carried out previously (Azmarina) *et al*., 2025).

Based on these gaps, this study is important to conduct because it offers a more comprehensive approach in analyzing the determinants of unsafe actions in outsourced workers by integrating individual and organizational factors in a single analytical framework. The novelty of this research lies in its focus on outsourcing workers in high-risk manufacturing industries, the use of *cross-sectional analytical survey design* to identify simultaneous relationships between variables, and the presentation of empirical evidence from the context of the sugar industry in Indonesia that is still rarely studied in the international literature. Scientifically, the results of this research are expected to enrich the treasure of global OHS research, while practically being the basis for the

formulation of a more inclusive occupational safety intervention strategy for outsourced workers.

Based on this description, this study was formulated to identify factors related to unsafe *work behaviors* in outsourced workers at the PT Madubaru mill station installation, Yogyakarta. The hypothesis of this study states that there is a significant relationship between individual factors and organizational factors with the occurrence of unsafe actions in outsourcing workers. The purpose of this study is to analyze the determinants of unsafe actions in outsourced workers as the basis for strengthening occupational safety management in high-risk manufacturing industries.

Methodology

Research types and designs

This study is an analytical survey research with a quantitative approach using a cross-sectional design. This design was chosen to analyze the relationship between various individual and organizational factors and unsafe acts in outsourced workers in a single observation time period. The cross-sectional approach allows simultaneous data collection on independent and dependent variables, making it appropriate to identify association patterns in industrial work environments with operational and time constraints.

Time and place of research

The research was carried out during the active production period at the PT Madubaru mill station installation, Yogyakarta. This location was chosen because it is a high-risk work area involving the use of heavy machinery, high-speed mechanical processes, as well as the direct involvement of outsourced workers in key production activities.

Population and research sample

The population in this study is all outsourcing workers who worked at the PT Madubaru mill station installation at the time of the study. The research sample was determined using *a total sampling technique*, where all members of the population who met the inclusion criteria were used as respondents. The inclusion criteria include outsourcing workers who are directly involved in the production process, have a minimum working period of three months, and are willing to become respondents. Workers who are on leave or are not actively employed at the time of data collection are excluded from the sample.

Research variables

The dependent variable in this study is unsafe *acts*. Independent variables include attitudes towards occupational safety, work competence, effectiveness of safety procedures, and policies on the use of personal protective equipment (PPE). All independent variables were selected based on a recent literature review that showed their association with occupational safety behavior in high-risk industrial environments.

Research instruments and data

Data were collected using a structured questionnaire compiled based on international literature and adapted to the context of the sugar industry. The research instrument consists of several sections that measure respondent characteristics, individual factors, organizational factors, and unsafe actions. The questionnaire uses appropriate measurement scales, including the Likert scale to measure perceptions and attitudes towards occupational safety. Tests of the validity and reliability of the instruments are carried out prior to the main data collection to ensure the accuracy and consistency of the measurements.

Data collection procedure

Data collection was carried out through direct surveys to respondents at the work site while still paying attention to the safety and ethical aspects of the research. The data collection procedure includes: (1) coordination with the management and field supervisors, (2) explanation of the objectives and benefits of the research to the respondents, (3) the provision *of informed consent* sheets, and (4) the filling out of questionnaires independently by the respondents with the assistance of the researcher if necessary. All data were collected in a single time period to maintain the consistency of *the cross-sectional* design.

Data analysis techniques

The data that has been collected is analyzed using statistical software. Univariate analysis was performed to describe the frequency distribution and characteristics of respondents. Bivariate analysis was used to test the relationship between each independent variable and the insecure action, using statistical tests that corresponded to the data type. Furthermore, multivariate analysis was performed to identify the dominant determinants of unsafe actions by controlling for confounding variables. The results of the analysis are presented in the form of relevant association measures and interpreted based on the research objectives and the conceptual framework of occupational safety.

Research ethics considerations

This research was carried out by paying attention to the ethical principles of research, including the confidentiality of respondent data, voluntary consent, and the use of data solely for scientific purposes. The identity of the respondents was kept confidential and was not included in the research report.

Result and Discussion

Results

1. Univariate Analysis

Table 1. Distribution of Respondents Based on Research Variables

Variable	Categories	n	%
Attitude	Good	26	50,0
	Not good	26	26
Work competencies	Good	27	51,9
	Not good	25	48,1
Effectiveness of safety procedures	Good	28	53,8
	Not good	24	46,2
PPE usage policy	Good	24	46,2
	Not good	28	53,8
Unsafe *acts*	Doing	19	36,5
	Not Doing	33	63,5

The results of the univariate analysis showed that the distribution of attitudes towards work safety of respondents was in a balanced proportion between the good and bad categories (50.0% each). The work competence of the respondents was mostly in the good category (51.9%), although the difference with the bad category was relatively small. From the organizational aspect, more than half of the respondents assessed the effectiveness of safety procedures to be in the good category (53.8%),

while the policy on the use of personal protective equipment (PPE) was more considered bad (53.8%).

Regarding the dependent variable, as many as 36.5% of respondents reported unsafe *acts*, while 63.5% of respondents did not commit unsafe acts. These findings show that although most workers do not engage in unsafe acts, the proportion of workers who still exhibit unsafe behavior is significant and requires special attention in occupational safety management.

2. Bivariate Analysis

Table 2. The Relationship of Individual and Organizational Factors with Unsafe *Acts* in Outsourcing Workers

Variable	Unsafe Actions		RP (95%CI)	P
	Doing	Not doing		
Attitude				
Good	5 (9,6)	21 (40,4)	2,800 (1,180-6,646)	0,010
Not Good	14 (26,9)	12 (23,1)		
Worker Competencies				
Good	3 (5,8)	24 (46,2)	5,760 (1,905-17,419)	0,000
Not Good	16 (30,8)	9 (17,3)		
Effectiveness of OHS Procedure				
Good	4 (7,7)	24 (46,2)	4,375 (1,677-11,412)	0,000
Not Good	15 (28,8)	9 (17,3)		
PPE Policy				
Good	3 (5,8)	21 (40,4)	4,571 (1,513-13,817)	0,001
Not Good	16 (30,8)	12 (23,1)		

The results of the bivariate analysis showed that all independent variables had a significant relationship with unsafe *acts* in outsourced workers. Attitudes towards occupational safety were significantly associated with unsafe acts, where workers with poor safety attitudes had a 2.8 times higher prevalence of unsafe acts than workers with good safety attitudes (RP = 2,800; 95% CI: 1,180–6,646; p = 0.010).

Work competency shows the strongest relationship with insecure actions. Workers with poor work competence had a 5.76 times higher prevalence of unsafe acts than workers with good work competence (RP = 5.760; 95% CI: 1.905–17.419; p < 0.001). The effectiveness of safety procedures was also significantly associated with unsafe acts, where respondents who rated safety procedures ineffective had a higher risk of committing unsafe acts (RP = 4.375; 95% CI: 1.677–11.412; p < 0.001).

In addition, the policy on the use of personal protective equipment (PPE) shows a significant relationship with unsafe acts. Workers who worked in environments with

poor PPE policies had a 4.57-fold higher prevalence of unsafe actions than workers with good PPE policies (RP = 4.571; 95% CI: 1.513–13.817; p = 0.001).

Discussion

The results of this study show that unsafe actions (*Unsafe Acts*) is still found in a significant proportion among outsourced workers in high-risk manufacturing industries. These findings are in line with the international literature that confirms that unsafe behaviour is a major determinant of work accidents in the industrial sector, especially in work environments with exposure to machinery and intensive production processes (Guo *et al.*, 2025; Santana *et al*., 2023). Studies in journals *Mugla Journal of Science and Technology* report that workers with non-standard employment status, including outsourcing, tend to have lower levels of safety compliance than permanent workers, due to limited access to training and weak organizational attachment (Kale, 2020). Thus, the results of this study strengthen empirical evidence that outsourcing work status is an important context in the study of occupational safety behavior.

The significant relationship between attitudes towards occupational safety and unsafe actions found in this study is consistent with the theory *Theory of Planned Behavior* and safety behavior models widely used in international OHS research (Rose) *et al*., 2021). Previous research has shown that positive attitudes toward safety play a role in increasing workers' intent and adherence to safety procedures, while negative attitudes correlate with increased unsafe acts (Ismail, 2020). Cross-country studies in the manufacturing sector report that workers with low safety perceptions are more likely to normalize risky behaviors as part of their work routines (Al-Kuwari *et al*., 2021; Five *et al*., 2022). These findings confirm that behavior change interventions should be directed not only at increasing knowledge, but also at the formation of positive safety attitudes.

Work competence emerged as the factor that had the strongest relationship with unsafe actions in this study. These findings are in line with various studies that confirm that low technical competence and understanding of occupational risks are the main predictors of unsafe acts in the industrial environment (Yeşilgöz & Arğa, 2025; Yosef *et al*., 2023). Previous research has also shown that outsourced workers are often placed in risky jobs without adequate training, thus increasing the likelihood of operational errors and unsafe behavior. In addition, other studies state that work competence includes not only technical skills, but also the ability to recognize hazards and make safe decisions in dynamic work situations (Pledge) *et al*., 2022). Thus, improving work competence is a key strategy in preventing unsafe acts.

The effectiveness of safety procedures has also been shown to be significantly related to unsafe measures. These findings support the findings that the existence of safety procedures alone is not enough to prevent unsafe acts, if the procedures are unclear, difficult to understand, or not applied consistently (Zhu *et al*., 2020). International studies report that poorly socialized safety procedures tend to be ignored by workers, particularly in groups of outsourced workers who have lower organizational involvement (Varahala, 2025). The results of this study confirm the importance of a systemic approach in safety management, where safety procedures must be designed in a practical, easy to understand, and relevant to real working conditions (Awwad, 2024).

In addition to individual and procedural factors, the policy on the use of personal protective equipment (PPE) also shows a significant relationship with unsafe actions. These findings are in line with research that emphasizes that compliance with the use of PPE is strongly influenced by organizational policies, facility availability, and enforcement

of rules by management (Mutiarahman *et al*., 2025). Studies in various industry sectors show that weak supervision and indecisive sanctions against violations of the use of PPE contribute to the normalization of unsafe behavior (Krasnykov, 2023). In the context of outsourcing workers, unclear responsibilities between the main company and the labor provider often weakens the implementation of PPE policies, increasing the risk of unsafe acts (Sigh) *et al.*, 2025).

Overall, the findings of this study confirm that unsafe actions in outsourced workers are the result of complex interactions between individual factors and organizational factors. This is consistent with the *safety management system* model and *safety culture framework* that are widely used in international OHS research, which places safety behavior as a product of the work system as a whole. The novelty of this study lies in its focus on outsourced workers in the sugar industry, a manufacturing sector that is relatively rarely studied in the Q1 literature, as well as in an integrative approach that examines attitude, competence, safety procedures, and PPE policy factors simultaneously in a single analytical model.

The practical implications of this study are the need for a more inclusive occupational safety management strategy for outsourced workers, especially in terms of improving work competence, strengthening safety attitudes, simplifying and enforcing safety procedures, and consistent PPE policies. From the scientific side, this study contributes to expanding international empirical evidence on the determinants of unsafe acts in workers with non-standard work status, as well as opening up opportunities for further research with longitudinal designs or interventions to test the effectiveness of occupational safety programs in more depth.

Conclusion

The study concludes that *unsafe acts* are still found in a significant proportion among outsourced workers in high-risk manufacturing industries. These findings show that unsafe behavior remains a major challenge in the management of occupational safety and health, especially in groups of workers with non-standard work status.

The results of the study confirmed that attitudes towards occupational safety, work competence, the effectiveness of safety procedures, and the policy of using personal protective equipment (PPE) had a significant relationship with unsafe actions in outsourced workers. Work competence emerged as the factor that had the strongest association, indicating that workers' technical abilities and understanding of work risks are key elements in the prevention of unsafe behavior. These findings confirm that an occupational safety approach that focuses on individual behavior needs to be integrated with strengthening organizational systems and policies.

Scientifically, this study contributes to enriching the international literature on the determinants of *unsafe work behaviors* in outsourced workers in the manufacturing industry sector, especially in the sugar industry which is still relatively rarely studied. Practically, the results of this study emphasize the importance of a more inclusive occupational safety management strategy for outsourced workers, through improving work competence, forming positive safety attitudes, strengthening the effectiveness of safety procedures, and enforcing policies on the use of PPE consistently. This research is expected to be the basis for the development of more effective and sustainable occupational safety interventions in high-risk industrial environments.

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