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Relationship of Safety Knowledge and Safety Skills with Safety Behavior in Chemical Manufacturing Companies

Zanifa Azielia[1], Endang Dwiyanti[2]
[1,2] Faculty of Public Health, Airlangga University, Surabaya, Indonesia

E-mail : [1]zanifa.azielia-2020@fkm.unair.ac.id, [2] endang.dwiasfar@fkm.unair.ac.id
Corresponding Author : zanifa.azielia-2020@fkm.unair.ac.id,

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ABSTRACT

Work accidents that occur in the workplace can harm workers and companies both materially and non-materially and temporarily or permanently. Workplace accidents are unwanted events that can cause physical injury to a person even fatal to death or lifelong disability and property damage. The main cause of accidents in the workplace is due to a lack of knowledge, skills and other factors from within the individual who will eventually tend to behave unsafely at work. This study is quantitative research with research type observational analytical research with a cross-sectional design. This study employed a total population sampling method, including all 35 participants from X Company and residents of the Z Plant area, conducted during March to April 2024. Data were collected through questionnaires and interviews. Spearman correlation analysis was used to assess the strength of the relationship. The results showed that the strong relationship between knowledge (r = 0.377) with safety behavior was in the low category. While the strong relationship between skills (r = 0.470) with safety behavior is in the medium category.

Introduction

A workplace is defined as any room or area—whether open or enclosed, movable or stationary—where employees perform their tasks, frequently enter for business purposes, and where hazards may be present (Law No.1 of 1970 on Occupational Safety). For a location to be considered a workplace, it must meet three key criteria: (1) work is conducted within it, (2) workers are present, and (3) work-related hazards exist within the area. Workplace hazards pose a risk of causing occupational accidents and diseases. Sources of danger may arise from the condition of operating machinery, the work environment, the nature of the tasks, the methods employed, and the production processes. Occupational hazards are an unavoidable aspect of the work environment (Law No.1 of 1970 on Occupational Safety). Work accidents that occur in the workplace can harm workers and companies both materially and non-materially and temporarily or

permanently (Rahayu, 2015). Work accidents are unwanted events that can cause physical injury to a person even fatal to death or lifelong disability and property damage (ILO, 2013). In addition, work accidents that occur may reduce the operational efficiency of a company. According to the International Labor Organization (ILO) in 2013, over 250 million workplace accidents occur each year, and more than 160 million workers suffer from illnesses related to workplace hazards. Additionally, approximately 1.2 million workers lose their lives due to accidents and illnesses at work.

BPJS Ketenagakerjaan (2022) reports that the number of workplace accidents in Indonesia rose by over 200,000 cases from the pandemic in 2020 to 2022. There were 221,740 reported cases of work accidents in 2020, which increased to 234,270 in 2021. By November 2022, the total number of workplace accidents had further increased to 265,334 cases. The high incidence of workplace accidents can be attributed to insufficient knowledge, attitudes, and behaviors regarding safety, along with a lack of proactive and preventive measures implemented by companies (Syaputra, 2022). Heinrich (1941) states that 88% of workplace accidents result from unsafe actions or behaviors of workers. Bird and Germain (1985) further explain that the primary cause of workplace accidents is often a deficiency in knowledge, skills, and other individual factors, which ultimately leads to unsafe behavior at work.

This assertion is backed by research from Maulana et al. (2022), which indicates a significant relationship between knowledge and safety behavior. In contrast, a study by Ananda et al. (2023) found no significant relationship between knowledge and safety behavior among workers at PT PLN UPT Daya.

Research by Gultom and Noeroel (2020) demonstrated a significant and positive relationship between skills and the safety behavior of respondents, indicating that higher skill levels correspond to safer behavior. Conversely, a study by Bilqis et al. (2021) found a negative relationship between worker competence and unsafe behavior among workers.

PT X is a company involved in chemical manufacturing located in Gresik, East Java. Analysis of secondary data from PT X revealed an increasing trend in unsafe worker actions at the Z Plant from 2020 to 2023. Consequently, a study was undertaken to examine personal factors related to workers' safe behavior, specifically focusing on knowledge and skills.

Method

This study employs a quantitative approach with an observational analytical research design, as data is gathered through direct observation without any specific treatment applied. It utilizes a cross-sectional design since data collection on the variables occurs at a specific point in time. Based on the data analysis, this research is descriptive, providing an overview of the relationships between the variables.

The study's population consists of 35 workers from PT X in Gresik, East Java. The research was conducted at PT X from Z Plant residents during March to April 2024. Data collection instruments included questionnaires and interviews with the work area supervisor. The results were analyzed using the Spearman correlation test method to assess the strength of the relationships between the variables.

According to Sugiyono (2017), the interpretation of relationship strength is as follows.

Table 1. Coefficient Interval that Shows the Strength of the Relationship

Coefficient Interval	Description
0,00 – 0,199	Very Low
0,20 – 0,399	Low
0,40 – 0,599	Medium
0,60 – 0,799	Strong
0,80 – 1,00	Very Strong

Result and Discussion

Safety behavior in this study is in the form of workers' compliance and participation in implementing safety efforts starting from compliance with work implementation based on SOPs, use of PPE, and social support related to hazard sensitivity. Safety behavior measurement uses a questionnaire with a guttman scale.

Based on the table below, obtained from filling out the questionnaire by workers, it is known that 29 out of 35 workers or 82.9% behaved well in implementing safety behavior in their work area.

Table 2. Frequency Distribution of Safety Behavior in Workers at PT X

Safety Behavior	Total (n)	Percentage (%)
Good	29	82,9
Enough	6	14,1
Less	0	0,00
Total	**35**	**100**

Knowledge in the research conducted is related to PPE, the risk of hazards in the work area, the purpose of safety, and the consequences of unsafe behavior, as well as ways to create safe and comfortable conditions and environments for work. Knowledge was classified into three categories, namely good, sufficient, and deficient with Likert scale measurement.

Based on table 5.5, it is known that workers at Z Plant PT X have a good level of knowledge related to occupational safety and safe behavior in the workplace, which is 34 workers or 97.1%.

Table 3. Frequency Distribution of Knowledge among Workers at PT X

Knowledege	Total (n)	Percentage (%)
Good	34	97,1
Enough	1	2,9
Less	0	0
Total	**35**	**100**

The skills measured in this study are related to the extent to which understanding is applied into practical skills in recognizing the risk of hazards in the work area and the ability to perform emergency response if needed in certain situations. Skills are also classified into three, namely good, sufficient, and deficient.

Based on the table below, it can be seen that most, namely 23 out of 35 workers or 65.7% of workers have applied their understanding of hazard risks and emergency response into practical skills in the workplace.

Table 4. Frequency Distribution of Skills among Workers at PT X

Skill	Jumlah (n)	Percentage (%)
Good	23	65,7
Enough	12	34,3
Less	0	0
Total	**35**	**100**

Relationship between Knowledge and Safety Behavior in Workers at PT X

Based on the research results and measurements conducted, the Spearman correlation indicates a relationship strength of 0,377. This positive correlation suggests that as the level of knowledge improves, so does the safety behavior of workers. However, the Spearman correlation results demonstrate a low strength of relationship. This finding aligns with research by Ananda et al. (2023), which reported no significant relationship between knowledge and safety behavior among workers at PT PLN UPT Daya.

Similarly, research by Jumardi et al. (2019) found an insignificant relationship between knowledge and unsafe behavior among workers at the Bank Indonesia Development Project (KPwBI) in Kendari City. According to Pushpa Edwina (2017), this discrepancy can be attributed to the fact that behavior is influenced not only by knowledge but also by desire, will, motivation, and intention, factors that were not addressed in this study. Sirait and Indriati (2016) further explain that workers with good knowledge may not necessarily exhibit safe behavior, which can be influenced by other factors such as awareness and motivation from their environment.

Table 5. Relationship between Knowledge and Safety Behavior

Knowledge	*Safety Behavior*						Total	
	Good		Enough		Less			
	N	%	N	%	N	%	N	%
Good	29	82,9	5	14,2	0	0	34	97,1
Enough	0	0	1	2,9	0	0	1	2,9
Less	0	0	0	0	0	0	0	0
Total	**29**	**82,9**	**6**	**17,1**	**0**	**0**	**35**	**100**
r	**0,377**							

The results of interviews with supervisors in the work area show that workers actually understand and know about the risks of hazards in the workplace, the importance of using PPE, and safe behavior because humans naturally have their own hazard alarms. However, workers have a wide range of responses. This shows that it is important to consider psychological and individual factors in developing an effective safety program, such as workers' motivation, desire and attitude towards safety.

Relationship between Skills and Safety Behavior of Workers at PT X

The Spearman correlation test results indicated a value of 0,470. This positive relationship suggests that as safety skills improve, safety behavior also enhances. The Spearman correlation reflects a medium strength of relationship. This moderate correlation aligns with research by Gultom and Noeroel (2016), which found a connection between skills and safety behavior among workers in confined spaces.

According to Suma'mur (1981), work skills encompass both the knowledge of how to perform tasks and practical application, including detailed attention to safety aspects. As an individual's work skills increase, it is expected that their safety practices will also improve, thereby reducing the likelihood of accidents (Gultom and Noeroel, 2016). However, a study by Sankar and K. S. Anandh (2024) found that leadership and a strong safety climate contribute to improved safety behaviors, sometimes outweighing the role of individual skills. It emphasizes the importance of fostering an environment that prioritizes safety at the organizational level.

Safety Behavior

Skill	*Safety Behavior*						Total	
	Good		Enough		Less			
	N	%	N	%	N	%	N	%
Good	22	62,9	1	2,9	0	0	23	65,7
Enough	7	20	5	14,2	0	0	12	34,3
Less	0	0	0	0	0	0	0	0
Total	**29**	**82,9**	**6**	**17,1**	**0**	**0**	**35**	**100**
r	**0,470**							

The interview results indicate that workers' skills are still unevenly distributed. Some workers are unable to effectively carry out emergency response measures. For instance, when workers encounter incidents such as dust in their eyes or scratches, they often do not provide immediate first aid.

The interview results show the importance of emergency response and first aid training, as well as efforts to recognize and respond to a hazard. This is in accordance with the opinion expressed by McSween (2003) that new skills help employees ensure a safe level of work practices all the time, not just when a supervision or observation is carried out.

Conclusion

The results indicated that the relationship between knowledge (r = 0.377) and safety behavior falls within the low category. In contrast, the relationship between skills (r = 0.470) and safety behavior is classified as medium.

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