

Unsafe Behavior of Workers in Rotary Lathe Section in One of the Plywood Industries in East Kalimantan

Perilaku Tidak Aman Tenaga Kerja di Bagian *Rotary Lathe* pada Salah Satu Industri Kayu Lapis di Kalimantan Timur

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Abstract

Occupational accidents and diseases remain the global health problem, two main factors for this are unsafe behavior and conditions. Previous study proved that the main cause is unsafe behavior factor. This study aimed to analyze factors associated with occupational unsafe behavior in workers at PT IAW and analyze the most influential factor. A cross-sectional study was conducted from July to August 2016 with 104 samples. Independent variables consisted of perception, communication, supervision, the availability of personal protective equipment (PPE), training and workplace temperature. While the dependent variable was unsafe behavior. Data analysis used Pearson product moment and multiple linear regression. In conclusion, perception (p value=0.00, $R=0.817$), communication (p value=0.000, $R=0.810$), supervision (p value=0.00, $R=0.529$), availability of PPE ($p=0.000$, $R=0.902$) and workplace temperature are related significantly, very strong, positive and directly proportional to unsafe behavior, while training (p value=0.092, $R=0.166$) are not related. Perception is the most dominant variable influencing unsafe behavior.

Keywords: External factor, internal factor, unsafe behavior

Abstrak

Kecelakaan kerja dan penyakit akibat kerja masih menjadi masalah kesehatan dunia, dua faktor utama penyebabnya adalah perilaku dan kondisi lingkungan kerja yang tidak aman. Penelitian sebelumnya membuktikan penyebab utamanya adalah faktor perilaku yang tidak aman. Penelitian ini bertujuan menganalisis faktor-faktor yang berhubungan dengan perilaku tidak aman dalam bekerja pada tenaga kerja di PT IAW dan menganalisis faktor yang paling berpengaruh. Penelitian potong lintang dilakukan pada bulan Juli sampai Agustus 2016 terhadap 104 sampel penelitian. Variabel bebas terdiri dari persepsi, komunikasi, pengawasan, ketersediaan alat pelindung diri (APD), pelatihan dan suhu lingkungan kerja. Variabel terikat adalah perilaku tidak aman. Analisis data menggunakan Pearson produk moment dan uji regresi linier berganda. Disimpulkan persepsi (nilai $p=0,00$, $R=0,817$), komunikasi (nilai $p=0,000$, $R=0,810$), pengawasan (nilai $p=0,00$, $R=0,529$), ketersediaan APD (nilai $p=0,000$, $R=0,902$) dan suhu lingkungan kerja berhubungan signifikan, sangat kuat, positif dan berbanding lurus dengan perilaku tidak aman, sedangkan pelatihan keselamatan kerja (nilai $p=0,092$, $R=0,166$) tidak berhubungan. Persepsi keselamatan kerja merupakan variabel yang paling dominan memengaruhi perilaku tidak aman dalam bekerja.

Kata kunci: Faktor eksternal, faktor internal, perilaku tidak aman

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Introduction

According to a report by the International Labour Organisation (ILO), every day, 6,300 people die as a result of occupational accidents or occupational diseases.¹ More than 2.3 million deaths per year, 317 million accidents occur on the job annually; many of these results in extended absences from work. The human cost of this daily adversity is vast and the economic burden of poor occupational safety and health practices is estimated at 4% of global Gross Domestic Product (GDP) each year. Hence, it can be ascertained that occupational accidents and diseases will be one of the problems in global health.

Indonesian Labor Social Security Agency (BPJS) noted that the cases of occupational accidents in the participants of insurance program in 2015 amounted to 50,089.² The figure decreased from the previous year with 53,319 cases. Despite the decline in the number of accidents, efforts to reduce the risk of occupational accidents will continue to be one of the priorities for building a health and safety culture by various parties.

According to the multiple causation theory introduced by Petersen,³ causes of accidents can be grouped into two major categories, namely unsafe human act and unsafe condition. Unsafe human act is an act of a person who deviates from the rules that have been defined and can result in a danger to themselves and others, and the existing equipment in the vicinity. Unsafe condition is that the environment working conditions are unsafe and can cause occupational accidents directly or indirectly.³ Heinrich in Neal and Griffin,⁴ believes that the cause of 88% of accidents is unsafe acts, the cause of 10% of accidents is unsafe conditions, and the cause of 2% of accidents is unforeseen factors.

As a citation by Ying,⁵ 88% of all industrial accidents were caused primarily by unsafe acts of persons. There is no general consent on definition of an unsafe act. However, it has been defined in similar focus on unaccepted practices which have the potential for producing future accidents and injuries. Several unsafe acts have been identified by many researchers such as Holt,⁶ and Aksorn and Hadikusumo⁷, these unsafe acts are working without authorized job, failure to warn or to secure members out of danger, working at improper speeds, improper lifting, handling, or moving of objects, improper placing and stacking of objects and materials, incorrect use of tools and equipment, hand tools, power tools, and machinery, using defective equipment and tools to work, annoyance and horseplay in the workplace, ignoring to wear personal protective equipment (PPE), removing safety guards from the workplace or equipment, smoking, creating naked flame or sparks in work areas, leaving nails or other sharp objects protruding from timber, throwing or accidentally dropping objects from high levels, working under the effects of alcohol and other drugs, improper

positioning of tasks, improper posture for tasks, servicing equipment which is in operation, working with lack of concentration, working in poor physical conditions.

Geller,⁸ stated the prevention of occupational accidents can be done by establishing a safety culture that consists of three factors that are the human factors, behavioral factors, and environmental factors. Then, Geller,⁸ integrated approach human factor and behavior factor as a human aspects which consist of internal factors (perception, motivation, attitudes, beliefs, personality) and external factors (training, communication, active interest, surveillance, compliance) that will affect the behavior of labor in safe or unsafe behavior at workplace.

PT IAW is one of the plywood industries in North Kalimantan, which is engaged in timber and wood panel/plywood products. Of nine parts of production owned by the company, part of Rotary Lathe is the highest contributor to workplace accidents. In 2015, 21 cases of occupational accidents have occurred in this section, and the cause is careless/uncareful in doing the job. Types of accidents bruises by falling rotary knife, shrapnel beetle on the eyes, hands jammed in the reeling machine, and bruises on the leg by a falling log fishing rod which has a capacity of five tons.

This study aimed to analyze the factors associated with unsafe behavior in workers at PT. IAW Industries Tarakan and to analyze the most influential variables on unsafe behavior at work.

Method

A cross-sectional study had been done on workers at PT IAW Tarakan, North Kalimantan in July to August 2016. In this study, the sampling technique used a purposive sampling with inclusion criteria that were willing to be respondents, over 3 years of working period, permanent employee status, workers were present on the study. Of the 159 people on the labor population of Rotary Lathe, 104 samples were taken as respondents. The independent variables in this study consisted of safety perception, safety communication, supervision, availability of PPE, safety training, workplace temperature, while the dependent variable was the unsafe behavior.

The unsafe behavior at the workplace was measured by using a questionnaire with Likert scale, while Guttman scale questionnaires was applied to measure safety communication, supervision, availability of PPE and safety training. All of questionnaires had been tested previously and proven valid and reliable. The workplace temperature measurement used Thermohyrometer. Data analysis in this study used the Pearson correlation product moment and multiple linear regression.

Results

Based on Table 1, it can be seen that most respon-

dents were in the range of 21 to 32 years of age (54.8%), males (78.8%), working as operator (54.8%), in the range of 4 to 11 years of working period (64.4%), high school graduates (82.7%), and at almost balanced work shifts between shift A (39.4%), shift B (32.7%) and shift C (27.9%).

Table 2 presents that the perception of safety between the poor and the good was almost balanced (44.2% and 55.8%), majority of safety communication was good (60.6%), supervision was mostly good (64.4%), PPE was available (69.2%), most respondents had received training (63.5%), the workplace temperature was mostly below TLV (68.3%), and safe/unsafe behavior at work was almost balanced (44.2 % and 55.8%).

Based on Table 3, it can be seen that the safety perception with behavior had a significant relation and a correlation coefficient of 0.817 and it was positive, the correlation was very strong and directly proportional. Safety communication with work behavior had a significant relation and a correlation coefficient of 0.810 and it was positive, the correlation was very strong and directly proportional. Supervision with work behavior had a significant relationship and a correlation coefficient of 0.529 and it was positive, the correlation was moderate and directly proportional. Availability of PPE with work behavior had a significant positive correlation and directly proportional, with a correlation coefficient of 0.905 (very strong). Safety training was not correlated with work behavior (p value = 0.092). Workplace temperature with work behavior had a significant positive correlation and directly proportional, with a correlation coefficient of 0.336 (strong enough).

Table 4 indicates that the value of the Kolmogorov-Smirnov had a significance value of 0.075 (> 0.05), hence inferred residual data from the independent variable (safety perception (χ_1), safety communication (χ_2), supervision (χ_3), Availability of PPE (χ_4), safety training (χ_5), and workplace temperature (χ_6) had a normal distribution.

Variance Inflation Factor (VIF) value of all variables was <10, (safety perception = 4.556, safety communication = 4.431, supervision = 1.574, availability of PPE = 3.005, safety training = 1.371, and workplace temperature = 1.602), it can be concluded that in the regression model multicollinearity did not occur. The points on the scatterplot graph spread below and above the number 0 on the Y axis, as well as the distribution did not form a specific pattern which concluded that there was equality of variance. Durbin-Watson test obtained a value of 1.920, it can be concluded that there was no autocorrelation.

The correlation coefficient (R) of 0.936 indicated that the influence of these variables was explained by the significant and showed a very strong relation and positive.

Table 1. Characteristics of Respondents

Characteristic	Category	Frequency	%
Age	21-32 year	57	54.8
	>32-44 year	29	27.8
	>44-52 year	18	17.3
Sex	Male	82	78.8
	Female	22	21.2
Job Position	Chief of section	2	1.9
	Head of work team	11	10.6
	Functional	34	32.7
Working period	Operator	57	54.8
	4-11 year	67	64.4
	12-19 year	17	16.4
	20-27 year	16	15.4
Education level	27-53 year	4	3.8
	Elementry	2	1.9
	Junior high school	15	14.4
	Senior high school	86	82.7
	Diploma 5	0	0
Shift work	Bachelor degree	1	1.0
	Shift A	41	39.4
	Shift B	34	32.7
	Shift C	29	27.9

Table 2. Results of Univariate Analysis

Variable	Category	Frequency	%
Safety perception	Poor	46	44.2
	Good	58	55.8
Safety communication	Poor	41	39.4
	Good	63	60.6
Supervision	Poor	37	35.6
	Good	67	64.4
Availability of PPE	Unavailable	32	30.8
	Available	72	69.2
Safety Training	Unfollow	38	36.5
	Follow	66	63.5
Workplace temperature	Exceeding TLV (>300C)	33	31.7
	Not exceeding TLV (18-300C)	71	68.3
Behavior	Unsafe	46	44.2
	Safe	58	55.8

Notes:

PPE : Personal Protective Equipment, TLV : Threshold Limit Value

Table 3. Results of Bivariate Analysis

Variable	p Value	r
Safety perception - behavior	0.000*	0.817
Safety communication - behavior	0.000*	0.810
Supervision - behavior	0.000*	0.529
Availability of PPE - behavior	0.000*	0.905
Safety training - behavior	0.092	0.166
Workplace temperature - behavior	0.000*	0.336

Notes:

*significant correlation

Hence, simultaneously, safety perception (χ_1), safety communication (χ_2), supervision (χ_3), Availability of PPE (χ_4), safety training (χ_5), and workplace temperature (χ_6) had a great strong relation against unsafe behavior. The result of F test (simultaneous) obtained the signifi-

Table 4. Classical Assumption Test Results

Classical Assumption Test		Result
Normality Test	Unstandardized residual	Sig 0.075
Multicollinearity test	Safety perception	VIF 4.556
	Safety communication	VIF 4.451
	Supervision	VIF 1.574
	Availability of PPE	VIF 5.005
	Safety training	VIF 1.371
	Workplace temperature	VIF 1.602
Heteroskedasticity test	Scatterplot	Spread
Autocorrelation test	Durbin-Watson	1.920

Table 5. The Results of Multiple Linear Regression Analysis

Parameter		β	p Value
Correlation of coefficient (R)	0.936		
Coefficient of determination (R ²)	0.876		
Simultaneous test (Ftest)			0.000
Partial test (T test)	Constant	8.189	0.245
	Safety perception	0.230	0.001
	Safety communication	0.406	0.026
	Supervision	0.093	0.540
	Availability of PPE	1.927	0.000
	Safety training	-0.119	0.377
	Workplace temperature	-0.371	0.163

cant value 0.000 and F value = 114.729 (> F table = 2.19). This means that safety perception (χ_1), safety communication (χ_2), supervision (χ_3), availability of PPE (χ_4), safety training (χ_5), and workplace temperature (χ_6) had a simultaneously significant correlation with unsafe behavior at work. T test (partial) showed a significant influence of safety perception to unsafe behavior at work (p value = 0.001), significant influence of safety communication to unsafe behavior at work (p value = 0.024), no significant influence of supervision to unsafe behavior at work (p value = 0.540), significant influence availability of PPE to unsafe behavior at work (p value = 0.000), no significant influence of training to unsafe behavior at work (p value = 0.377) and there was no significant influence of workplace temperature to unsafe behavior at work (p value = 0.163).

The coefficient of the independent variable or a beta value of each variable that influenced unsafe behavior in a row showed the constant of 8.189, safety perception (χ_1) of 0.230, safety communication (χ_2) of 0.406, supervision (χ_3) of 0.93, availability of PPE (χ_4) of 1.927, safety training (χ_5) of 0.119, and workplace temperature (χ_6) of 0.371. The regression model can be written as Equation 1.

The constant value of 8.189 shows that if the value of safety perception (χ_1), safety communication (χ_2), supervision (χ_3), availability of PPE (χ_4), safety training (χ_5), and workplace temperature (χ_6) had no change or fixed, the unsafe behavior would increase by 8.189. If there was

one additional unit of safety perception and the other variable was constant (fixed), the unsafe behavior would increase by 0.230, etc.

Discussion

Perceptions of occupational health and safety relate to unsafe behavior at work. According to Geller,⁸ safety behavior is influenced by internal and external factors, one of which is perception. Perception is the process of receiving information and making sensing or sense the surrounding environment, starting from the information obtained, how to categorize such information, and how to interpret it within the framework of knowledge. Then the results of this study are in accordance with previous results by Gyekye dan Haybatollahi,⁹ concluding that the perceived level of fairness in an organization is closely associated with workplace safety perception and other organizational factors which are important for safety, workers' level of experience related to the perception of workplace safety perception, and workplace safety perception related to safety behavior and accident frequency.

Communication of health and safety associate with unsafe behavior at work. The results of this study are in line with previous studies by Liao *et al.*,¹⁰ showing that rather than communication frequency, management communication style was significantly related to worker cognitive failure; specifically, communication style related to perception of convenience and self-capacity, which could be upstream factors explaining unsafe behavior at the construction jobsite.

The results of this study are in accordance with the results of study on unsafe behavior in the construction sector carried out by Khosravi *et al.*,¹¹ finding that causes of unsafe behaviors and accidents on construction sites appeared to be multifactorial, and generally related to society, organization (including safety communication), project management, supervision, contractor, site condition, work group, and individual characteristics.

Supervision is related to unsafe behavior at work. This result is in line with the opinion of Geller,⁸ and Bird and Germain,¹² stating that the manager at the company has a very important role in the formation of worker's behavior. Supervisors have a key position in influencing the knowledge, attitude, skills, behavior and habit of all workers in the area of responsibility. The results of this study are in accordance with the study by Fang *et al.*,¹³ obtaining that confirmatory factor analysis and structural equation modeling showed both direct and indirect impacts of supervisory behavior on the existence of workers' safety behavior.

Supervision is one of the influential factors to unsafe behavior and workplace accident as concluded by Khosravi in his study entitled "Factors Influencing Behaviors and Accidents Unsafe on Construction Sites".

Supervision factor consists of effective enforcement, supervision style, safety engagement, communication, competency and performance pressure.

Availability of PPE was correlated to unsafe behavior. The results of this study has been conform with the opinion of Khosravi,¹¹ stating that unsafe behavior and workplace accident are influenced by many factors, and ones of which are the condition of the working environment and the availability of adequate working equipment, including PPE. The results of this study are consistent with previous study by Sebsibe *et al.*,¹⁴ indicating that the availability of PPE is associated with the use of PPE and unsafe behavior among textile factory workers in Hawassa Town, Southern Ethiopia.

The result of Pearson Product Moment test obtained correlation value of 0.166 and it was positive, the correlation was very low and directly proportional. Then, the results of multivariate analysis obtained the significance value of 0.377 (> 0.05) and t value ($0.888 < t$ table (1.660) means partial no significant effect of training to unsafe behavior at work. These results are not in line with the results of study by Khosravi,¹¹ revealing that education and training affect the unsafe behavior at work. The results of this study are also not in accordance with the study by Prasad and Calapathi,¹⁵ that health and safety training can influence to the attitudes of workers and safe working behavior with the effective contribution at 81%, health and safety training programs had positive effect on reducing the unsafe behavior and workplace accidents.

Working environment temperature was associated with unsafe behavior at work. The results of this study are consistent with the statement of Geller,⁸ saying that the safety culture is the result of the interaction of three main factors, namely the human factor consisting of knowledge, skills, motivation, ability and personality; environmental factors consisting of the condition of the equipment, machinery production, housekeeping, standard operating procedure; and behavioral factors such as training, recognition, communication and active attitude of caring. The temperature of the working environment included into the environmental factors, the heat exposure in the workplace can be generated from production machinery and production processes that can affect comfort at work. Workers who are exposed to excessive heat (above the threshold limit value) will work hastily and indifferent to safety because they are anxious to avoid hot areas.

The results of this study are in line with the conclusion by Chandrasekar,¹⁶ examining the workplace environment and its impact on organizational performance in public sector organisations. It was concluded that the work environmental factors such as poorly designed work stations, unsuitable furniture, lack of ventilation,

inappropriate lighting, excessive noise, insufficient safety measures in fire emergencies, and insufficient PPE are influential to occupational disease and it impacts on the employee's performance.

Conclusion

This study shows that the safety perception with behavior has a significant relation and a correlation coefficient of 0.817 and it is positive, the correlation is very strong and directly proportional; safety communication with work behavior has a significant relation and correlation coefficient of 0.810 and it is positive, the correlation is very strong and directly proportional; supervision with work behavior has a significant relation and a correlation coefficient of 0.529 and it is positive, the correlation is moderate and directly proportional; availability of PPE with work behavior has a significant relation and a correlation coefficient of 0.905 and it is positive, the correlation is very strong and directly proportional. Safety training is not correlated with work behavior ($p = 0.092$). Workplace temperature with work behavior has a significant positive correlation and directly proportional, with a correlation coefficient of 0.336 (strong enough). Safety perception is the greatest variable influencing unsafe behavior at work, in other words, the perception of safety is the most influential predictor to safe behavior at work.

Recommendation

Companies should increase the knowledge of workers at the rotary lathe section related to the introduction of potential hazards in the workplace with effective training methods, posters, information boards or improve the functioning of health and safety executive (HSE) information boards; then conduct special training program for workers in observing, preventing and reporting unsafe behavior that exist in the workplace; and increase the number of HSE to maximize the implementation of each HSE program.

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