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## How the Mediation Effect of Job Stress on the Relationship between Safety Leadership, Safety Culture and Safety Performance

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**Abstract:** Indonesia's mining company's safety performance in the last 2 years has seen a downward trend. The study aims to investigate the mediation effects of job stress on relationships between safety leadership, safety culture and safety performance. The research data is a questionnaire from the production department of coal mining companies in the Eastern Kalimantan Provinces. Sampling method are taken using the proportionate random sampling, with the number of respondents as many as 161 workes. The method of data analysis using of structural equation modelling. The findings of this study suggest that leadership, culture and job stress are having a positive effect on safety performance. The direct influence of safety leadership and the safety culture on safety performance is stronger than through the job stress. The direct influence of safety leadership on the safety performance is more powerful than the influence of the safety culture on the safety performance.

**Keyword:** Job Stress, Safety Culture, Safety Leadership, Safety Performance

### INTRODUCTION

Mining work presents a high risk of an accident (Stemn et al., 2019). Accidents that occur can either bring harm (accident) or not harm (near miss) (Friend & Kohn, 2007). An accident is an unexpected event that can cause injury workers, equipment to suffer damage and power disruption (Hughes & Ferrett, 2016). Accidents have peculiar causes according to work done and do not happen by chance and are therefore prevention against accidents (Friend & Kohn, 2007). Accident prevention is supervised by supervising accident sources of workers, equipment or machinery, job management, and work environment (Reese, 2012). Analysis of the model that causes accidents may use the accident theory of domino, which explains that accidents occur is a chronological sequence of events-factors responsible for accidents (Friend & Kohn, 2007). The number of causes for accidents according to the domino theory are factors of lack of control, personal factors, work factors, unsafe conditions and unsafe action (Bird Jr & Germain, 1990).

The number of accidents that occur in a company represents the corporate of safety performance, the higher the number of accidents that occur the lower of the safety performance

(Armstrong, 2006; Curcuruto et al., 2015). The number of mining and coal accidents in Indonesia during 2012-2019 indicates that the number of heavy-and-die mining accidents met with a trend of increases from 2017 to 2019. The company's target for the number of mining accidents is the absence of accidents, so the list of potential mining accidents has not been reached. The target the company would like to achieve on the number of accidents that occur is the safety performance (Armstrong, 2006).

Previous research has concluded that safety performance is affected by safety leadership (Skeppers & Mbohwa, 2015; Wu et al., 2008). The existing corporate safety culture also affects the performance of safety (Feng et al., 2014). The more mature the corporate safety culture will affect the company's increased safety performance (Stemn et al., 2019). The performance of safety for a company is affected by the company's climate of safety (Huang et al., 2018; Siu et al., 2004; Wu et al., 2008). Mohammadi et al., (2018) ) in a study commenting on the 90 previous studies, it leads to the conclusion that the factors-factors that affect the performance of safety are job motivation, existing regulation, safety investment, resources and equipment investment, work conditions, safety culture, safety leadership, safety leadership, employee behavior, organizational conditions and safety management systems.

Based on the background and the trend phenomena that the rise in the number of mining accidents is severe and will result in death, and previous research has been the basis of this research which has been aimed at investigating the mediation effects of the job stress on relationships the safety leadership, the safety culture and the safety performance at the coal mining company.

The study was supposed to provide the theoretical benefits of developing science especially the theory of mining safety. Specially this research tests and analyzes the roles of safety leadership, safety culture, and job stress in an effort to improve the safety performance and the role of job stress as a mediation in improving the safety performance in coal mining contractors. In practical terms, this research can be used as a consideration to the leaders of coal mining contractors in the policy of policing to improve the company's performance of safety through safety leadership and safety culture, and through the mediation role of the job stress.

## **METHOD**

### **Procedure and Sample**

The instrument used in this study is a questionnaire containing statements from each indicator on each of the variables studied and its application explanations, which are then spread online through the whatsapp application to immediate or to employers and coworkers. The population in this study is a production worker at 11 coal mining corporations in East Kalimantan Province of 296 people who are all to be sampled. Sampling was conducted using a method of proportional random sampling, so the number of samples was proportionately calculated in each company. Already filled out and restored 167 angkets, 5 angkets were incomplete and 1 angketted was inconsistent in value, so 161 angket is used in this study.

### **Measures**

#### **a) Safety Leadership**

Safety leadership is measured using by safety caring, safety controlling, safety motivation, dan safety policy (Du & Sun, 2012; Gracia et al., 2020; Lu & Yang, 2010; Wu et al., 2008). Safety caring is measured with four statements, safety controlling is measured with two statements and safety policy is measured with three statements. An assessment of each statement using a value of 1 to 5 or from highly disagreed until highly amended. Validity tests show that the value of correlation of each indicator is greater than critical value (0.1547) so that the research instrument is valid (Sanusi, 2017). The results of a reliability test are gaining

an cronbach alpha of 0.824 a higher than critical.70, with instruments said to be reliable (Nunnally & Bernstein, 1994).

b) Safety Culture

There are 4 indicators for measuring safety culture : management commitment, safety management system, appraisal of work hazards and employee involvement (Feng et al., 2014; X. Wu et al., 2015). Each indicator is measured using 2 statement items using the likert scale of 1 (highly disagreed) to a value of 5 (strongly agreed). The validity test of the study instrument indicates that all r-calculating values are larger than r-tables (0.1547), making the instrument valid. Reliability tests produced a cronbach alpha of 0.832 a higher than 0.070, so the instruments were said to be reliable (Nunnally & Bernstein, 1994).

c) Job Stress

Job stress measures use indicator are job demand, job insecurity, safety training, insufficient job control and lack of reward (Antonsen, 2009; Du & Sun, 2012; Flin et al., 2000; Griffin & Neal, 2000; Kvalheim & Dahl, 2016; Liu et al., 2015; Seo et al., 2015; Sherif Mohamed, 2002; Siu et al., 2004; Xia et al., 2020). All indicators are measured with 2 statement items, using a value scale from highly disagree (1) to strongly agree (5). Test the validity of all the existing safety climate statement items results in an r-count greater than the r-table (0.1547) so that all statement items can measure job stress (Sanusi, 2017). The result of Reliability tests on the variables statement of job stress provided a score of Cronbach Alpa 0.856 (greater than 0.70), leaving the statement on safety climate a reliable (Nunnally & Bernstein, 1994).

d) Safety Performance

Accident rate, accident frequency rate, accident severity rate and near miss are used as indicators of measuring safety performance (Armstrong, 2006; Feng et al., 2014; Singh et al., 2019; Siu et al., 2004; Wu et al., 2008). Each indicator is measured using 2 statement items with a value of 1 to 5 that describe strongly disagree to strongly agree. Each statement is validated to get a value of coefficient correlation ata level of significance ( $\alpha$ ): 0.05 greater than the coefficient value of the table correlation, so that all the statements are said to be valid or can be used to measure safety performance (Sanusi, 2017). The reliability tests performed on all statement items an alpha cronbach score of 0.801, with a critical cronbach alpha of.70 (Nunnally & Bernstein, 1994). It can be argued that all declaration items are reliable for measuring the safety performance.

## Analysis

Analysis conducted in this study is a descriptive analysis, to describe the tendency of respondents to judge the study variables (Sanusi, 2017), and data analyses use the structural model approach, which explains the causal relationship between those variables expressed in measuring equations and the structural model equation (Hair et al., 2014).

The testing of assumptions for structural equations was done before further analysis of data normality (Bentler & Chou, 1987; Bollen, 1989; Ghozali, 2013b, 2017; Latan, 2013), outlier analysis (Ferdinand, 2014; Ghozali, 2017), multicollinearity analysis (Ferdinand, 2014) and residual analysis (Bryne, 2010; Sanusi, 2017). A model compatibility test is made to see if a model is received or not by looking at the various criteria in a goodness-of-fit (Ferdinand, 2014). The analysis used in the structural equations model is the confirmatory factor (CFA), which is the analysis to judge the validity of a latent variable convergence made up of factor loading, average variance extract (AVE) and Construct reliability (CR) (Ghozali, 2017).

Hypothetical testing is done by looking at regression value weight on critical ratio ( $> 1.96$ ) or probability value 0.05 then hypotheses are accepted, if critical ratio  $< 1.96$  or probability value  $> 0.05$  then hypotheses are rejected (Ferdinand, 2014; Ghozali, 2017).

## RESULTS AND DISCUSSION

### Results

#### Descriptive Analysis

Desscriptive analysis results in the conclusion that the safety policy indicator contributes to the safety leadership, the safety culture is reflected by the management commitement, the safety communication indicator contributes most to shaping the job stress and the safety performance is shaped by accident severity rate.

#### Assumption analysis

Normality test scores multivariate = 2,524, but it is less critical (0,258) (Ghozali, 2017; Latan, 2013), no data outlier of all probability value (p2) greater than 0,000 (Ghozali, 2017), multicolinerity value = 0,372 is still below critical (.90) (Ghozali, 2013a), and all value of standarized residual covarian <2,58 (Bryne, 2010; Ghozali, 2017).

### Discussion

#### Confirmatory factor analysis and goodness of fit mode

Confirmatory factor analysis exogenous variable provides these results:

**Table 1. Results of Confirmatory Factor Analysis Exogenous Variable**

Variable	Indicators	Loading Factor	Cut-Off	Prob	Conclusion
Safety Leadership	Safety Caring	0,748	0,50	0,000	Valid
	Safety Controlling	0,838	0,50	0,000	Valid
	Safety Motivation	0,830	0,50	0,000	Valid
	Safety Policy	<b>0,894</b>	0,50	0,000	Valid
Average Variance Extract (AVE):		0,687	cut-off: 0,50		Valid
Construct Reliability (CR):		0,897	cut-off: 0,70		Reliable
Safety Culture	Management Commitment	<b>0,913</b>	0,50	0,000	Valid
	Safety Management System	0,909	0,50	0,000	Valid
	Appraisal of Work Hazards	0,835	0,50	0,000	Valid
	Employee Involvement	0,690	0,50	0,000	Valid
Average Variance Extract (AVE):		0,708	cut-off: 0,50		Valid
Construct Reliability CR):		0,995	cut-off: 0,70		Reliable

Source: Primary data prepared (2022)

All indicators on safety leadership have a value loading factor above critical value (0.50) and of AVE, CR also above that it should reflect safety leadership (Ghozali, 2017; Hair et al., 2014). All of the value of loading factors in the safety culture of and perceived value of AVE and CR is greater than their criticisms and the safety management system, the appraisal of work hazards and employee involvement is able to represent the safety culture (Ghozali, 2017; Hair et al., 2014). Endogenous variables analysis is:

**Tabel 2. Results of Confirmatory Factor Analysis Endogenous Variable**

Variable	Indicators	Loading Factor	Cut-Off	Prob	Conclusion
Job Stress	Job demand	0,765	0,50	0,000	Valid
	Job Insecurity	0,811	0,50	0,000	Valid
	Lack of reward	0,798	0,50	0,000	Valid
	Insufficient job control	0,800	0,50	0,000	Valid
Average Variance Extract (AVE):		0,629	cut-off: 0,50		Valid

Construct Reliability (CR):		0,871	cut-off: 0,70		Reliable
Safety	Accident Rate	0,716	0,50	0,000	Valid
Performance	Accident Frequency Rate	0,835	0,50	0,000	Valid
	Accident Severity Rate	0,792	0,50	0,000	Valid
	Near Miss	0,783	0,50	0,000	Valid
Average Variance Extract (AVE):		0,612	cut-off: 0,50		Valid
Construct Reliability (CR):		0,863	cut-off: 0,70		Reliable

Source: Primary data prepared (2022)

Indicator on job stress have loading factor value is greater than critical (0,50), AVE and CR value also greater than critical therefore job demand, job insecurity, lack of reward and insufficient job control are capable of reflecting the job stress (Ghozali, 2017; Hair et al., 2014). The value loading factor, AVE and CR for the indicators of safety performance is greater so that indicators : accident rate, accident frequency rate, accident severity rate and near miss are able to explain safety performance (Ghozali, 2017; Hair et al., 2014).

The results of the corresponding model for all four variables are  $\chi^2$  (chi square) on df = 161 is 185.106, still under the cut-off value (191.608); probability 0.094 ( $\geq 0.05$ ); RMSEA = 0.031 ( $\leq 0.08$ ); GFI = 0.904 ( $\geq 0.90$ ); CMIN / DF = 1.150 ( $\leq 2.00$ ); AGFI = 0.875 ( $\geq 0.90$ ); TLI = 0.987 ( $\geq 0.90$ ); CFI = 0.989 ( $\geq 0.90$ ); PGFI = 0.693 ( $\geq 0.50$ ) and PNFI = 0.780 ( $\geq 0.60$ ). Of the 10 corresponding index existing models 9 index meet good criteria and 1 model meets the marginal criteria so that the filed model is acceptable (Ferdinand, 2014; Ghozali, 2013b; Latan, 2013; Schumacker & Lomax, 2004).

### Path Analysis and Hypothesis Testing

Path analysis as the below of picture 1 suggests that the impact connecting safety leadership on safety performance has the value of regression = 0.330 with probability 0.000, so it can be said that safety leadership is a positive impact on safety performance so hypothesis 1 verified. The causality between the safety culture to the safety performance results in the value of regression = 0.194 with probability 0.007, and it can be explained that the safety culture has a positive effect on the safety performance, making it statistically acceptable for hypothesis 2. The correlation of job stress on the safety performance gives the coefficient value of regression = 0.274 and probability 0.000 it can be explained that job stress is a positive influence on safety performance, making it acceptable for hypothesis 3.

Safety leadership affects the safety performance through the job stress, it may be explained that the direct value of safety leadership on safety performance is 0.330 while its indirect impact value of 0.081 and the total impact value of 0.411. The direct value of influence is greater than the value of indirect influence, this shows that the direct line of influence is more powerful than the mediation line, while the greater total value of the direct influence values suggests that the job stress as mediating on the relationships the safety leadership has on the safety performance. The impact of the safety culture on the safety performance through the job stress is explained that the value of a safety culture's direct influence on safety performance is 0.194 while its indirect influence value is 0.117 and the total impact value of 0.311. The direct value of influence is greater than the value of indirect influence, which shows that the direct line of influence is more powerful than the mediation line, while the total impact value of direct influence is indicative that the job stress is mediating on the relationships of the safety culture's influence on the safety performance.



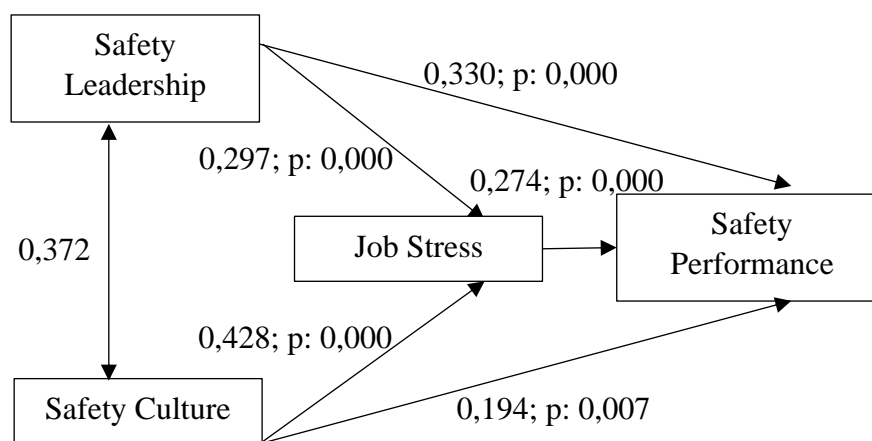


Figure. 1. Final Path Analysis with Standardized Coefficients

## CONCLUSION

The findings of this study are that safety leadership has a positive effect on safety performance, the more safety leadership works well in companies, the more safety performance will increase. The safety culture is having a positive effect on the performance of corporate safety, the more the safety culture is run in the company then the more the safety performance will increase. The job stress also has a positive effect on a company's safety performance, the more the job stress in a company increases the more it will affect the performance of safety. Safety leadership and the safety culture also affect the safety performance through the job stress, the direct influence of safety leadership and the safety culture to safety performance is greater than the impact through the job stress.

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