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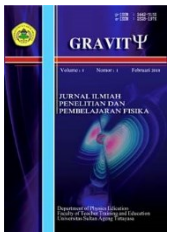

Analysis of the effect of noise on blacksmith's performance using linear regression

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ABSTRACT

Noise in itself can be harmful or dangerous to health. The research objectives were to determine the noise value generated by blacksmiths and analyze noise levels' effect on blacksmith performance. The research was conducted by direct observation and giving questionnaires to respondents. Data processing using the t-test to determine the level of noise and its effect on blacksmiths. This study's conclusion is the level of significant difference with the Threshold Value (NAV) set by the government, which is 99.328 dB (A). Meanwhile, the government's NAV for the work area (industry) is 85 dB (A). The simple linear regression analysis results indicate that the blacksmith's work area's noise has no significant effect on employee performance. This is shown from the test results of simple linear regression analysis through the t-test, obtained t count of -0.365 smaller than t table of 2.069 or the number sig. Equal to 0.719, which is greater than α of 0.05.

Keywords: blacksmith performance, linear regression, noise, production tools, work area

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INTRODUCTION

Sound is a physical disturbance in a medium (such as gas, liquid, or solid) detected by the human ear (Ahmad, F, 2018). Noise is unwanted sound from various sources so that it disturbs or endangers health. Noise is a physical hazard factor that is often found in the work environment. Noise cannot be separated from industrial development because almost all industrial processes will cause noise (Fithri, 2015). One of them is the creative industry for the manufacture of various products from iron. The use of machines and work tools to support the production process has the potential to cause noise.

Noise is all unwanted sounds/sounds that come from production process tools and work tools, which at a certain level can cause hearing loss (Andriani, 2017). Quebec in Canada, Frechet obtained data that 55% of industrial areas have a noise level of more than 85 dB. Increasing sound with irregular complex waves known as noise is one of the stressors for individuals. When this happens repeatedly and continuously so that it goes beyond individual adaptation, it results in harmful stress conditions (Roestam, 2004). Noise is a prob-

lems that directly impact and interfere with everyday human activities and even threaten comfort levels human health (Rusjadi, 2011).

The noise itself has been formulated in the Minister of Health Decree No. 1405/ MENKES/SK/XI/2002. Noise can cause various disorders such as physiological disorders, psychological disorders, communication disorders, and deafness. Noise that occurs continuously for a certain period of time can cause health problems and discomfort at work (Mujayin, 2012). The noise generated by production machines is quite disturbing for workers, such as: communication problems, dizziness, and fatigue. This is increasingly at risk if workers do not use personal protective equipment (PPE) for the ears while working and are exposed continuously, namely 8 hours/day (Nofirza, 2015).

Noise levels that exceed the threshold value can lead to hearing loss and the risk of damage to the ears, both temporary and permanent, after being exposed for a certain period of time without the use of personal protective equipment (Rimantho, 2014).

A blacksmith or blacksmith is one of the workers who often get noise when the iron-making process. The use of machines as a blacksmith's working tool and mechanization in the industry can cause noise in the workplace. (Hiola, 2016). Blacksmiths themselves should get special attention because they are an essential element in the production process. Therefore, blacksmiths must be guarded, fostered, and developed to increase their productivity. A healthy blacksmith will support the production process to run and establish smoothly, continuously, not disturbed by accidents.

This research aimed to determine the intensity of the noise at the ironworks manufacturing site and determine the effect of noise on blacksmiths in five iron crafts factories in Bojonegoro Regency. Based on the background description, this research's problem can be formulated, namely how to determine the intensity of the noise at the place where iron handicrafts are made in Bojonegoro Regency. And how to find out the effect of noise on blacksmiths in five iron crafts manufacturing sites in Bojonegoro Regency.

The purpose of this research is to determine the intensity of noise at the iron craft manufacturing site in Bojonegoro Regency and to determine the effect of noise on blacksmiths in five iron crafts manufacturing sites in Bojonegoro Regency.

RESEARCH METHODS

This research was conducted to collect data on blacksmiths' conditions in Bojonegoro Regency, East Java Province. In this district, there is a village where the residents have priority as a blacksmith. Data processing and analysis will be carried out at Bojonegoro University, Kalirejo Village, Bojonegoro District, Bojonegoro Regency. The time for research, data processing, and report production will be carried out until December 2020.

The research will begin with conducting a preliminary study to observe noise problems and conclude the method for problem-solving. Furthermore, a literature study was carried out to study the theories needed to achieve the research objectives. After that, the identification of the data needs is required when the research is carried out. Field surveys carried out data collection to obtain the noise intensity value where the iron craft was made and interviews with blacksmiths to find out the disturbances obtained from the noise in that place. To determine the value of noise intensity, a measuring instrument called a sound level meter (Ardiansyah, 2013). This tool will detect the noise at the points that are the source of the noise, for example, blacksmith's machine tools, both conventional and modern. The T-test is carried out to determine whether the resulting noise follows the established standards from the noise intensity value. To assess the effect of noise, questionnaires and interviews were carried out to workers where the questionnaire was about the disturbances that occur due to noise, such as hearing loss, disruption, balance, communication disorders, physiological disorders, and psychological disorders. The number of respondents was 25 blacksmith workers. Validity and reliability tests are used to measure the validity and relia-

bility of a questionnaire. Furthermore, the results of the T-test and the results of the questionnaire carried out linear regression analysis.

RESULTS AND DISCUSSION

T-test

To test whether the noise level in the iron processing work area in Kedaton Village, Kapas District, Bojonegoro Regency is following the set standard, which is 85 dB (A), it is necessary to do a t-test from the noise value data that has been taken in Kedaton Village, Kapas District, Bojonegoro Regency. This noise value data collection uses a noise meter or sound level meter. The noise value data are as follows:

Based on the measurement of the noise value in table 1, the average value of measuring the noise level in the iron processing work area is 00.328 dB (A). Then the t-test is carried out with the calculation results obtained as in table 2.

Table 1. Noise values in the iron processing work area

No	Noise (dB)
1	100
2	102,3
3	105,6
4	94
5	95,2
6	97,2
7	99,1
8	102
9	101
10	103,4
11	98
12	97
13	100
14	97
15	102
16	95
17	105
18	97
19	100,3
20	100,6
21	97
22	95
23	98,3
24	99,7
25	101,5

Table 2. T-Test Results

T count	T table	significance	Information
22.292	1.96	0.0000	Different

The t-test shows that the t count of 22.292 is greater than the t table of 1.96 or the sig value. By 0, it is smaller than α of 0.05. This shows that the blacksmith's work area's noise level is above the average noise level set by the government, which is 85, and this difference is statistically very significant. The noise threshold value (NAB) has been recommended according to (ACGIH) and ISO (International Standard Organization) of 95 dB (A). At the same time, according to OSHA (Occupation Safety and Health Association), it is 90 dB (A) for 8 hours of work a day and 40 hours a week (Prabu, 2009). Meanwhile, (Imansyah 2006) states that the maximum level that the human ear can hear is 130 dB (A), although it is recommended that humans should not get that much noise level.

Test the Validity and Reliability of the Questionnaire

The variables used for the questionnaire in this study and their operational definitions are as follows: The independent variable (X) in this study is noise (X). Meanwhile, the dependent variable (Y) in this study is the blacksmith's performance (Y). The indicators and question items for each variable are presented in table 3.

From the statement items, the following instruments are given to answer and evaluate:

Strongly Disagree (STS): 1
Disagree (TS): 2
Simply Agree (CS): 3
Agree (S): 4
Strongly Agree (SS): 5

The data from the blacksmith questionnaire was then tested for the validation and reliability of each research variable. This test is done as a first step to finding out whether the questionnaire data obtained can be processed for further data processing. This test was carried out using SPSS software, and the

Table 3. Variables, indicators, and Statement Items

Variable	Indicator	Statement Items
Noise (X)	1.Psychological Disorders	a.Feeling disturbed / uncomfortable b.Lack of concentration c.Tiring easily d.Easy to get angry
	2.Communication Disorders	a.Often screams in the work area when communicating b.Often miscommunication at work
	3.Distraction Fisiologis	a.Hearing less clear b.Feel dizzy / headache while working c.Ulcer, stomach pain, nausea d.Hard to breathe
Blacksmith's Performance (Y)	1.Quantity	a.The ability to complete work according to the given target b.Ability to complete work with consistent results and quantities
	2.Quality	a.Do a good jobTerampil dalam melaksanakan pekerjaan b.Quality of work according to the standards set c.High accuracy in doing pekerjaan
	3.Time	a.The accuracy of completing the task within the set time target
	4.Motivation	a.High morale and work ethic b.Always try to correct mistakes in work c.Always make serious efforts to complete assignments.

results can be seen in table 4 and table 5.

Table 4. Recapitulation of the Validity and Reliability Test of Noise Variables (X)

Relationships	Koef Correlation	R Table	Sig.	Information
$X_1 - X$	0,051	0.279	0.035335	Invalid
$X_2 - X$	0,824	0.279	0.004604	Valid
$X_3 - X$	0,132	0.279	7.28E-05	Invalid
$X_4 - X$	0,753	0.279	0.000108	Valid
$X_5 - X$	0,004	0.279	0.093362	Invalid
$X_6 - X$	0,411	0.279	0.322678	Valid
$X_7 - X$	0,494	0.279	0.000271	Valid
$X_8 - X$	0,167	0.279	0.428022	Invalid
$X_9 - X$	0,613	0.279	0.033741	Valid
$X_{10} - X$	0,622	0.279	0.058779	Valid
Cronbach's alpha value = 0.762				Reliable

Based on the test results presented in table 4, it can be concluded that there are several items in the noise variable (X) that are valid, but some have a disability. Each item's validity is seen from the relationship between each item's scores, with the total score having r count greater than r table or significantly smaller than α of 0.05 and vice versa for invalid. While the Cronbach alpha value obtained is 0.762, more significant than 0.6, so that the noise variable (X) can be said to be reliable.

Table 5. Recapitulation of the Validity and Reliability Test of the Blacksmith Performance Variable (Y)

Relationship	Correlation coefficient	R Table	Information
Y1 – Y	0,464	0.279	Valid
Y2 – Y	0,385	0.279	Valid
Y3 – Y	0,736	0.279	Valid
Y4 – Y	0,245	0.279	Invalid
Y5 – Y	0,714	0.279	Valid
Y6 – Y	0,483	0.279	Valid
Y7 – Y	0,430	0.279	Valid
Y8 – Y	0,082	0.279	Invalid
Y9 – Y	0,432	0.279	Valid
Y10 – Y	0,523	0.279	Valid
Cronbach's alpha value = 0 .706			Reliable

Based on the test results in table 5, it can be concluded that there are several items in the noise variable (X) that are valid, but some have a disability. The validity of each item is seen from the relationship between each item's scores, with the total score having r count greater than r table or significantly smaller than α of 0.05 and vice versa for invalid. While the Cronbach alpha value obtained is 0.706, more significant than 0.6, so that the noise variable (X) can be said to be reliable.

Based on data through a questionnaire given to 25 blacksmiths to find out how much influence noise has on the performance of employees in the blacksmith was working area in the Kedaton village, cotton Bojonegoro district. The questionnaire results found that there were disturbances in psychological indicators, communication indicators, and physicological indicators due to noise. On the hands of psychological disorders, most respondents agreed that the noise caused by work tools in the work area made respondents irritable and tired quickly. On the communication disturbance indicator, most respondents agreed that the noise caused by work tools in the work area made respondents often miscommunicated at work. On the hands of physicological disorders, respondents agreed that the noise caused by work tools in the work area made hearing less transparent. In contrast, respondents stated that they disagreed that the noise caused by work tools in the work area caused the respondent to experience disturbances in the stomach and digestive system and shortness of breath. This is supported by research (Feidihal, 2007) which states that noise can affect psychological, communication, and physiological factors.

Employee performance is seen from several indicators: quantity, quality, time, and motivation. On the quantity indicator, most respondents agreed that the respondent was able to complete the job according to the target given when working in a noisy area. This shows that blacksmiths' performance in the blacksmith work area is still good in terms of quantity. Although disturbing psychologically, communicating, and physically but blacksmiths try to maintain the amount of work, the noise they experience daily is disturbing psychologically, speaking, and physically.

On the quality indicator, most respondents stated that they strongly agreed that the work quality had been done well. The respondents agreed that the quality of work followed the quality standards set when working in noisy areas, and respondents were always careful in doing their job. This shows that blacksmiths' performance in the iron production work area is in terms of good quality. Although disturbing psychologically, communicating, and physically but blacksmiths try to maintain the quality of work, the noise they experience every day, although disturbing psychologically, speaking, and physically.

On the time indicator, the majority of respondents always complete tasks or jobs on time. The effect of noise that they experience every day does not interfere with blacksmiths' activities at work, so that blacksmiths tend not to delay work so that the work is completed on time.

For motivation indicators, most respondents agreed that they always tried to correct mistakes they had made in carrying out work. Apart from that, respondents also agreed that they always try to seriously finish their work thoroughly even though there are psychological, communication, and physiological disturbances caused by noise.

Regression Analysis

Before a simple regression analysis was carried out to determine the effect of noise on blacksmith performance, the next step was to carry out some classical assumption tests, including the normality test, multicollinear heteroscedasticity test. This data normality test is carried out to test whether, in the regression model, confounding or residual variables have a normal distribution. The data normality test in this study used the Smirnov Colmograph test, and the results are shown in Table 6. Based on table 6, it can be seen that the sig. The resulting consequence is greater than α of 0.05, so it can be concluded that the questionnaire data is spread normally.

Table 6. Data Normality Test Results

Kolmogorof Smirnov	sig.	Information
0.144	0.194	Normal

Multicollinearity testing aims to test whether the regression model found a correlation between independent variables. The results of multicollinearity testing for each independent variable are presented in Table 7. Based on the developments in table 7, it can be seen that the VIF value of the independent variable is smaller than 10, so it can be concluded that there is no multicollinearity between the independent variables in the regression model.

Table 7. Multicollinearity Test Results

Independent Variable	VIP	Information
X	1,000	Non Multicollinearity

The heteroscedasticity test aims to test whether there is an inequality of variance from the residuals of one observation to another in the regression model. The results of heteroscedasticity testing using a scatter plot are presented in Figure 1. The scatter plot image shows that the dots are randomly distributed and spread either above or below the number 0 on the Y-axis. It can be concluded that there is no heteroscedasticity in the regression model, so that the regression model is feasible. They are used to determine the effect of noise levels on blacksmith performance.

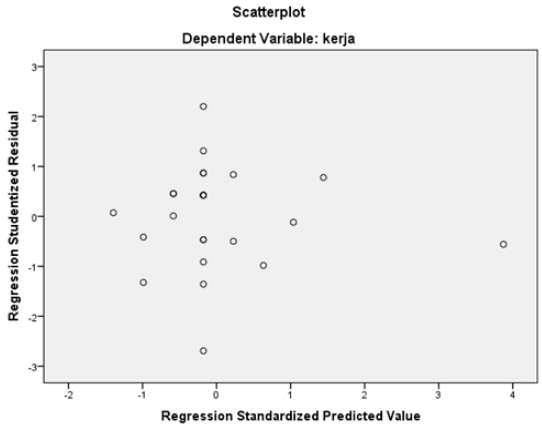

Figure 1. Heteroscedasticity Testing Results using the Scatter Plot

After fulfilling the three assumption tests, a simple linear regression analysis can be carried out. In this study, a simple linear regression analysis was performed using the SPSs software. The test results are shown in Table 8.

Table 8. Recapitulation of Simple Linear Regression Analysis Test Results

Variable	Regression Coefficient	t count	t table	Sig.	Information
Constant X	31,434 -0,069	- 0,365	2,069	0,719	Not rejected Ho
R R Square F Count F table (1.23; 0.05) Sig.		0,076 0,006 0,133 4,28 0,719			

Based on table 8. It can be seen that the correlation coefficient (R) of 0.076 indicates that the relationship between the Noise variable (X) and the blacksmith performance variable (Y) is weak. The amount of the noise variable (X) contribution to the blacksmith performance variable (Y) can be seen from the R Square of 0.006 or only 0.6%. This figure shows that the noise (X) used in this regression equation does not contribute to the blacksmith performance variable (Y) by 0.6%. While the rest, namely 99.4%, contributes from other variables not included in this study.

A linear regression equation is generated through the results of noise data processing and blacksmith performance using simple linear regression analysis. The simple linear regression equation of the effect of noise on blacksmith performance at SPSS output can be seen through Unstandardized Coefficients B, and the resulting equation is as follows:

$$Y = 31{,}434 - 0.069\ X \ldots\ldots (1)$$

The intercept obtained is 31.434 and is positive. This shows that if there is no noise

in the blacksmith working area in Kedaton

Village, Kapas District, Bojonegoro Regency, the blacksmith's performance is 31,434. The value of 31.434 shows that the blacksmiths' average performance is good if there is no noise disturbance in their work area.

The regression coefficient of the noise variable (X) is -0.069, which means that the noise variable does not significantly affect the performance of blacksmiths in Kedaton Village, Kapas District Bojonegoro Regency. This also shows that for each increase in noise, the blacksmith's performance in the blacksmith's work area will decrease by 0.069. This figure shows that the presence of noise affects blacksmiths' performance even though it is very small. But this noise disturbs the psychology, communication, and physiology of the blacksmith.

Based on the test results of simple linear regression analysis through the t-test, the t count is -0.365 smaller than the t table of 2.069 or the number sig. 0.791, which is greater than α of 0.05, so that Ho is accepted. Thus it can be concluded that noise (X) has no significant effect on blacksmith performance (Y). This is different from (Hanifa 2006) in his research that there is a meaningful relationship between noise and fatigue and a significant effect of noise on employee fatigue.

CONCLUSION

From the data processing that has been done using the t-test, it can be concluded that the noise level in the blacksmith work area in Kedaton Village, Kapas District, Bojonegoro Regency shows a significant difference with the Threshold Value (NAB) set by the government, which is 99.328 dB. (A). Meanwhile, the government's NAV for the work area (industry) is 85 dB (A). The simple linear regression analysis results show that noise in the blacksmith's work area has no significant effect on employee performance. This is shown from the test results of simple linear regression analysis through the t-test, obtained t count of -0.365 smaller than t table of 2.069 or the number sig. Equal to 0.719, which is greater than α of 0.05.

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