The Relationship between Noise Level and Work Stress

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ABSTRACT

This study aims to determine the relationship between noise levels and work stress levels in employees of the Gotri Gentong Factory in Semarang. The research location in the working area of the Gotri Gentong Factory in Semarang in the administration and production department. The research sample was 36 samples in employees in the production department and 36 samples of employees in the administrative department. Analysis of the relationship between noise levels and work stress levels in employees of the Gotri Gentong Factory Semarang using the chi-square test. The results showed that there was a meaningful relationship between noise intensity and stress levels with a prevalence value of 0.000 (< 0.05). For further research, it is necessary to use different types of treatment with different time periods.

KEYWORDS: noise, work stress

INTRODUCTION

Work stress is a source or work stressor that causes individual reactions in the form of physiological, psychological, and behavioral reactions. In simpler terms, stress due to work occurs due to the inability of workers to face a job demand (Tarwaka et al., 2004).

Stress that is often experienced by employees due to the environment around the workplace will affect their work performance, so the organization or company needs to improve or assess the organizational quality for employees. The decrease in stress experienced by employees will definitely improve health or quality in the organization. Work stress can have detrimental consequences for employees or companies (Aldi & Susanti, 2019).

Berney and Selye (Asih et al., 2018) reveal there are four types of stress:

a. Eustres (good stress)

It is stress that causes stimulus and excitement, so it has a beneficial effect on the individual who experiences it. For example: the challenges that arise from increased responsibility.

b. Distress

It is stress that causes harmful effects for individuals who experience it such as: unpleasant or excessive demands that drain the energy of the individual.

c. Hyperstress

That is stress that has a tremendous impact on those who experience it. Although it can be positive or negative, this stress still makes individuals limited their adaptability. An example is the stress caused by terrorist attacks.

d. Hypostress

It is stress that arises due to lack of stimulation. For example, stress due to boredom or due to regular work.

One of the physical stressors at work is caused by noise. High intensity noise is noise that exceeds the threshold value or is more than 85 dB while low intensity noise is noise below the threshold value or less than 85 dB (Harrianto, 2010). In a survey conducted by researchers at the Gotri Gentong Factory in Semarang, 7 out of 10 employees complained of headaches, difficulty concentrating, impatience, and irritability when in noisy places. Some of these complaints are symptoms of work stress.

According to WHO work stress occurs a lot in almost every job around the world and has become a "global epidemic". Based on research in several companies in Indonesia, around 15% to 30% of workers have experienced mental health

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problems ranging from mild complaints to those that cause disease (Ikrimadhani, 2015). In a survey conducted in Europe, around 40 million people in Europe experienced work stress. According to the European Risk Observatory Report Around 50% to 60% of workers experience work stress (ILO, 2016). In the previous study conducted by Pradana regarding the Relationship between Noise and Work Stress, it was found that 32% of the workforce experienced light work stress, 44% of the workforce experienced moderate work stress, and 22% of the workforce experienced severe work stress (Pradana, 2013). According to the European Foundation for The Improvement of Living and Working Conditions, work stress is the second largest case in Europe related to work. Health problems caused by stress include heart disease, back pain, hypertension, stroke, and musculoskeletal disorders. Physiological disorders caused by this stress also contribute to the rate of pain, disability, and death. About 75% to 90% of visits to corporate doctors are due to stress (Yunus, 2011). In addition, other negative impacts of stress are in the form of psychological symptoms such as dissatisfaction, boredom, and tension. If these symptoms continue, it can reduce work efficiency and productivity and has the potential to cause work accidents (Tarwaka et al., 2004). Physiologically, when the body is exposed to a situation that is considered threatening or the presence of a stressor, there will be a response to face it. The stress response is closely related to two systems in the body, namely the *sympathetic adrenomedullary* (SAM) system and the *hypothalamic pituitary adrenocortical* (HPA) axis which can cause physiological changes in the body. The earliest response is an increase in *sympathetic adrenomedullary* (SAM) system activity. This increase in *sympathetic* activity will stimulate the medulla of the adrenal glands so that the release of *catecholamines* such as *epinephrine* and *norepinephrine* occurs. Exposure to stressors not only increases the *sympathetic adrenomedullary* (SAM) system but also the *hypothalamic pituitary adrenocortical* (HPA) axis. The hypothalamus will secrete *corticotropin releasing factor* (CRF). CRF will stimulate the pituitary gland to secrete *adrenocorticotropic hormone* (ACTH).

The removal of ACTH will trigger the cortex of the adrenal glands to secrete glucocorticoids, especially cortisol. The function of the hormone cortisol is to help the body maintain itself during stress (Sherwood, 2011). Noise is one of the stressors that can cause stress. The effect of noise on stress depends on the intensity of the noise. High-intensity noise or noise that exceeds the threshold value causes physical disorders such as increased blood pressure, increased pulse, indigestion, disturbances in work, and increased fatigue. The influence of low intensity noise or below the threshold value can cause psychological disorders in

Characteristics of Respondents

This study involved 36 samples in employees exposed to high intensity noise (Production section) and 36 samples of employees such as irritability, headaches, sleep disturbances, psychomotor reaction disorders, loss of concentration, communication disorders, and decreased work performance (Tarwaka et al., 2004).

This study aims to determine the relationship between noise levels and work stress levels in employees of the Gotri Gentong Factory in Semarang.

METHOD

The type of research used in research is observational analytics with a case control approach. The research site at the Gotri Gentong Factory in Semarang is divided into two locations, namely in the administrative department and in the production department.

The sample of this study was 36 samples in employees in the production department and 36 samples of employees in the administrative department. Approximate size of the research sample based on calculations by using formulas :

$$n1 = n2 = \frac{(Z\alpha\sqrt{2PQ} + Z\beta\sqrt{P1Q1 + P2Q2})2}{(P1Q1)2}$$

$$= \frac{\left(1,96\sqrt{2x0,575x0,425} + 0,842\sqrt{0,5x0,5 + 0,65x0,35}\right)2}{(0,5x0,5)2}$$

$= 36,08$

So 36 samples were needed in the production department and 36 samples in the administrative department.

Information:

P1 = standard effect proportions (from the library)

P2 = proportion of effects studied (clinical judgement)

Z_α = degree of meaningfulness (set)

Z_β = power (set)

P = ½ (P₁+P₂)

$Q_1 = 1 - P_1$

$Q_2 = 1 - P_2$

Inclusion criteria:

1. Age 20-40 years.
2. In good health.
3. Have no previous history of hearing disease.
4. Service life ≥ 2 years.
5. Work shifts 8 hours per day.

Exclusion criteria:

1. Have a previous history of hearing disease.
2. Have a previous history of stress.
3. Respondents are sick e.g. high heat.
4. Respondents did not come during the study

The data were analyzed univariately and bivariately. Analysis of the relationship between noise levels and work stress levels in employees of the Gotri Gentong Factory in Semarang using the chi-square test (Dahlan, 2014).

RESULT

employees exposed to low intensity noise (Administration section). The following is a description of the characteristics

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of respondents, namely the distribution of the frequency of research samples according to age

Table 1. Distribution of Research Sample Frequency by Age

Age (years)	Production Section	Administration Section
Age group;		
20 – 25 years old	4 (11,11%)	1 (2,78%)
26 – 30 years old	10 (27,78%)	13 (36,11%)
31 – 35 years old	10 (27,78%)	11 (30,56%)
36 – 40 years old	12 (33,33%)	11 (30,56%)
Total	36 (100%)	36 (100%)

The table above provides information regarding the characteristics of research samples by age. Based on age The distribution of research samples based on the age group of 22-38 years, at least in the age group of 20 - 25 years as many as 4 samples (11.11%) in the production department and there was only one sample (2.78%) in the administrative department. Meanwhile, the distribution of research samples in the production section in the age group of 36-40 years was 12 samples (33.33%), and in the administrative section as many as 13 samples (36.11%) in the age group of 26-30 years.

The following is a description of the characteristics of respondents, namely the distribution of the frequency of research samples according to gender

Table 2. Frequency Distribution of Research Samples By Gender

Gender	Production Section	Administration Section
Man	24 (66,7%)	14 (38,89%)
Woman	12 (33,3%)	22 (61,11%)
Total	36 (100%)	36 (100%)

The distribution of research samples according to gender based on the table above, namely, in the production section of male sex samples there were 24 people (66.7%), and samples with female sex there were 12 people (33.3%). In the administration department, there were 14 samples of male sex (38.89%), and samples of female sex as many as 22 samples (61.11%).

Univariate Analysis

The following is a table of the distribution of research sample frequencies according to noise levels in this study:

Table 3. Frequency Distribution of Research Samples According to Noise Level

Noise Level Intensity (db)	Production Section	Administration Section
Point 1	96	58
Point 2	92	63
Point 3	93	61

The table above describes the measurements at 3 noise level points. In the production section measured at three measurement points of 96db each; 92db; 93dB, all three points are at high noise levels (> 85dB). The administrative part was measured at three measurement points of 58db each; 63db; 61dB, all three points are at low noise levels (< 85DB).

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Table 4. Distribution of Research Sample Frequency According to Stress Level

Stress Levels	Description
Normal	18 (25%)
Light	33 (45,8%)
Medium	20 (27,8%)
Heavy	1 (1,4%)
Very Heavy	-
Total	72 (100%)

The distribution of research samples according to stress levels based on the table above, namely, 18 samples (25%) experienced normal stress levels. There were 33 samples that experienced mild stress levels (45.8%). There were 20 samples that experienced moderate stress levels (27.8%). And there was only one sample that experienced severe stress levels (1.4%). And in this study there were no samples that had very heavy stress levels.

Bivariate Analysis

Based on the results of bivariate analysis with chi square test, a relationship can be obtained between noise intensity and stress level, as follows:

Table 5. Relationship between Noise Intensity and Stress Level

Bivariate Analysis	Stress Levels										Total		P value
	Normal		Light		Medium		Heavy		Very Heavy				
Noise intensity	n	%	n	%	n	%	N	%	n	%	n	%	
High (Production)	5	13,9	12	33,3	18	50	1	2,8%	-	0	36	100	
Low (Administration)	13	36,1	21	58,3	2	5,6	-	0	-	0	36	100	0,000
Total	18	25	33	45,8	20	27,8	1	1,4	-	0	72	100	

The table above shows the distribution of research samples based on the relationship between noise intensity and stress levels. In high noise intensity, there were 5 samples that experienced normal stress levels (13.9%), there were 12 samples that experienced mild stress levels (33.3%), there were 18 samples that experienced moderate stress levels (50%), there was one sample that experienced severe stress levels (2.8%). At high noise intensity the majority of the study sample experienced moderate stress levels.

In low noise intensity, there were 13 samples that experienced normal stress levels (36.1%), there were 21 samples that experienced mild stress levels (58.3%), and there were 2 samples that experienced moderate stress levels (5.6%). At low noise intensity the majority of the study sample experienced mild stress levels.

Meanwhile, statistically, the pattern of relationships between variables results in the form of a significance value of 0.000. The significance value is smaller than the specified significance limit of 0.05 or (0.000<0.05). With these results, it can be interpreted that there is a meaningful relationship between noise intensity and stress levels.

DISCUSSION

Based on the research that has been done, the following results were obtained

A. **Univariate Analysis**

1. **Noise Level**

The results showed that at the measurement of the noise of each field was carried out at three points. In accordance with the Decree of the Minister of Manpower No. 13/MEN/2011 on the Threshold Value of Noise in the workplace is 85 db. In the production section, from the three points measured regarding the noise level, successive results were obtained, namely 96db; 92db; 93db. As per its stipulation that all three points exceed the noise level threshold, so they can be categorized at high noise levels. This is natural, because in the field or production room there are various factory machines which of course are one of the producers of the source of noise. From tobacco sorting machines, the provision of cigarettes to filters in making cigarettes, using engine power which of course is the main source of noise.

Things are different in measuring noise levels in the room or administration. From the three measurement points, a result of 58db was obtained; 63db; 61db. All three points are still below the prescribed standard of 85db. In other

words, the runag or administration section is in the category of low noise level. In the administrative part, the work run is indeed separate and has a partition with the production room. Employees who work in this administrative department do need quiet space conditions. So that the partition between spaces is designed to minimize noise coming from the production runag or the surrounding environment.

2. Work Stress Level

In measuring work stress using a questionnaire measuring instrument. The results showed that of the 72 respondents who were sampled in the study, most of them were included in the category of light work stress. Broadly speaking, indicators of work stress include depression, anxiety and stress. The scale of depression contains statements about no positive feelings, can not develop, no hope, sad, moody, depressed, no interest, feel worthless, feel life useless and meaningful, do not get pleasure, are not enthusiastic, it is difficult to take the initiative. The anxiety scale consists of statements about dry mouth, shortness of breath, frequent trembling, anxiety, dizziness, causeless sweating, fear, difficulty swallowing, panic, helplessness. The stress scale consists of statements about being irritated at a small thing, overreactions, difficulty relaxing, wasted energy, impatience, tension, and anxiety (Kholifah, 2015).

B. Bivariate Analysis

The results showed that there was a meaningful relationship between noise intensity and stress levels with a prevalence value of 0.000 (< 0.05). The effect of noise on stress depends on the intensity of the noise. High-intensity noise or noise that exceeds the threshold value causes physical disorders such as increased blood pressure, increased pulse rate, indigestion, disturbances in work, and increased fatigue. The influence of low intensity noise or below the threshold value can cause psychological disorders in employees such as irritability, headaches, sleep disturbances, psychomotor reaction disorders, loss of concentration, communication disorders, and decreased work performance (Tarwaka et al., 2004).

The higher the intensity of the noise, the more the cortisol hormone will increase. Cortisol suppresses the immune system because it can reduce T lymphocytes so that in high noise exposure cortisol levels will increase and decrease the immune system. In addition, the effect of continuous stress due to an increase in cortisol levels will cause sympathetic nerve stimulation for vasoconstriction so that at high noise intensity exposure one of the symptoms is an increase in blood pressure (Braun & Ising, 2000) (Guyton & Hall, 2014). In addition to noise exposure, work stress is also influenced by several factors such as age, work shifts, workload, health conditions, and work mass (Sarwendah, 2013).

CONCLUSION

Based on the results of research that has been carried out, the conclusion of this study is that there is a meaningful relationship between noise intensity and stress levels with a prevalence value of 0.000 (< 0.05).

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