

## CHAPTER I

### INTRODUCTION

#### 1.1 Background

The widespread implementation of technology encourages the increase in the use of machines in various industrial processes. The intensive use of machines is expected to optimize productivity and production efficiency consistently, this phenomenon also poses a challenge in the form of increased exposure to noise in the work environment. Continuous exposure to machine noise can trigger stress and psychological disorders in workers, which ultimately leads to decreased productivity and causes work fatigue<sup>1</sup>.

*The World Health Organization* (WHO) released the World Report on noise on March 2, 2021. *The World Health Organization* (WHO) estimates that by 2050, nearly 2.5 billion will be living with some degree of hearing loss, and at least 700 million of them will need rehabilitation services<sup>2</sup>. Based on data from the Social Security Administration Agency (BPJS) of Employment, in 2022 there were more than 200,000 reports of work accidents. The construction and mining sectors are the main contributors, followed by the manufacturing and oil and gas (oil and gas) sectors. In addition, accidents in the informal work sector also have a significant number, although they are often not officially recorded. This data shows the importance of increasing the implementation of work safety protocols and more intensive supervision from the government<sup>3</sup>.

---

<sup>1</sup> Adam Surya Atmaja and Vaninda Eka Priadinata, "The Relationship Between Working Period, Workload, Noise Intensity and Work Fatigue at PT Nobelindo Sidoarjo," *Journal of Health Science and Prevention* 4, no. 1 (April 28, 2020): 14–22, <https://doi.org/10.29080/jhsp.v4i1.257>.

<sup>2</sup> Xin Sun, "Occupational Noise Exposure and Workers Health in China," *China CDC Weekly* (Chinese Center for Disease Control and Prevention, April 30, 2021), <https://doi.org/10.46234/ccdcw2021.102>.

<sup>3</sup> Indonesia Safety Center. (n.d.). *Work accidents in Indonesia: Data, causes, and prevention efforts*. [online] Available at: <https://indonesiasafetycenter.org/kecelakaan-kerja-di-indonesia-data-penyebab-dan-upaya-pencegahan/>

One of the most common physical hazard factors in the work environment is noise. Noise is an occupational health problem that always arises. Noise in the work environment can be interpreted as all unwanted sounds or noises that have a negative impact on the surrounding environment in the form of noise that can cause communication disturbances, concentration at work to permanent hearing loss <sup>4</sup>defects.

Many studies have been conducted to examine the impact of high-intensity noise disturbances on workers in the work environment. Noise not only affects hearing, but can also cause other effects, such as work fatigue<sup>5</sup>. According to *the World Health Organization* (WHO), health models designed through 2020 predict that psychological disorders in workers, such as extreme fatigue that can end in depression, have the potential to be the second largest cause of death after heart disease. In Indonesia, there are an average of 414 work accidents every day. As many as 27.8% of them are caused by high levels of fatigue, and around 9.5% are disabled<sup>6</sup>.

One of the factors that affect the level of work fatigue is exposure to noise in the work environment with an intensity that exceeds the Threshold Value (NAV), which is more than 85 dB. Noise can interfere with concentration and precision in carrying out activities or work. In addition, noise exposure causes psychological disorders, such as difficulty sleeping, which has an impact on reduced rest time. This condition can ultimately contribute to increased levels of fatigue<sup>7</sup>.

One of the efforts made by the field of Occupational Safety and Health (K3) is how to deal with complaints of fatigue in workers, where these

---

<sup>4</sup> Wolfgang Babisch, "The Noise/Stress Concept, Risk Assessment and Research Needs," *Noise and Health* 16, no. 4 (2002): 1–11.

<sup>5</sup> Jentry Octavianus Purba and Sri Zetli, "Analysis of Noise Intensity on Work Fatigue of Production Operators at Pt Eob," *JURNAL COOMASSIE* 5, no. 4 (2021).

<sup>6</sup> "Window of Public Health Journal, Vol. 5 No. 1 (February, 2024): 109 -116 SULFIKARS REPAIR," n.d.

<sup>7</sup> Indah Yani Tambunan, "The Relationship Between Noise Intensity and Work Fatigue in Workers at the Palm Oil Mill (PKS) of PT. X Rokan Hulu," *The Journal General Health and Pharmaceutical Sciences Research* 1, no. 3 (September 15, 2023): 34–45, <https://doi.org/10.57213/tjghpsr.v1i3.125>.

complaints are almost daily faced by workers. Work fatigue will affect work accidents, where workers who work in a tired state will experience a decrease in physical and psychological abilities.

Darussalam Gontor modern islamic boarding school Ponorogo operates a number of business units to meet large production demands, so that the production process of machines at high speed to achieve the daily production target increases vibration which can produce a high level of noise. Some of these business units include Darussalam Press, which is engaged in book printing, and Darussalam Convection, which focuses on the design of clothing and similar products, and the working period in printing and convection is 8 hours of work in 1 day, and 48 hours of work in 6 working days.

Initial observation results at Darussalam Press Unit 2 showed that the average noise disturbance level in production machine 1 reached 86.8 dB, in production machine 2 it was 87.9 dB, and in the convection section was 81.5 dB. This finding indicates that the Darussalam Press Unit 2 business unit has a noise disturbance problem that exceeds the Threshold Value (NAV), based on the Regulation of the Minister of Manpower of the Republic of Indonesia Number 5 of 2018 concerning Occupational Safety and Health of the Work Environment, that the standard Threshold Value (NAV) of work noise with a working duration of 8 hours of work is 85 dBA, based on article 10 paragraph (3) which reads if the results of workplace measurements exceed The Threshold Value (NAV) must be controlled<sup>8</sup>. If this condition is not immediately treated or prevented, it has the potential to reduce work productivity and work fatigue.

Referring to the background written by the author, the author wants to conduct a study on whether there is a relationship between noise intensity and work fatigue in printing and convection workers of the Darussalam Gontor Ponorogo business unit.

---

<sup>8</sup> Minister of Manpower of the Republic of Indonesia, "Regulation of the Minister of Manpower of the Republic of Indonesia Number 5 of 2018," [https://jdih.kemnaker.go.id/Asset/Data\\_Puu/Candy/Candy\\_5\\_2018.Pdf](https://jdih.kemnaker.go.id/Asset/Data_Puu/Candy/Candy_5_2018.Pdf), 2018,.

## **1.2 Problem Formulation**

The formulation of the problem in this study is whether there is a relationship between noise exposure level and the level of work fatigue in printing and convection workers of darussalam gontor ponorogo business unit?

## **1.3 Research Objectives**

### **1. General Purpose**

Analyzing the relationship between noise exposure level and the level of work fatigue in printing and convection workers of darussalam gontor ponorogo business unit.

### **2. Special Purpose**

- a. Analyzing the noise exposure level in the work environment in printing and convection workers of the Darussalam Gontor Ponorogo business unit.
- b. Analyzing the level of work fatigue in printing and convection workers of the Darussalam Gontor Ponorogo business unit.
- c. Analyzing the relationship between noise exposure level and the level of work fatigue in printing and convection workers of darussalam gontor ponorogo business unit.

## **1.4 Research Benefits**

### **1. For Researchers**

This research can add valuable insights and experience in the implementation and application of the knowledge and theories that have been obtained while in college about the dangers and risks in the work environment, especially the dangers of noise exposure level and level of work fatigue.

## 2. For Research Sites

The results of this study can be used as useful input on the study in the aspect of the relationship between noise intensity and work fatigue and can be applied in the work environment.

## 3. For the Occupational Safety and Health Study Program

Adding references and information in the Occupational Safety and Health Study Program, Darussalam Gontor University, especially regarding the relationship between noise exposure level and the level of work fatigue in printing and convection workers of darussalam gontor ponorogo business unit.



## 1.5 Originality Of Research

Research related to the relationship between noise intensity and work fatigue, such as the following studies:

**Table 1 Originality of Research**

No	Heading	Writer	Research Design	Variable	Subject	Result	Research Differences
1	The Relationship Between Noise Intensity and Factory Work Fatigue at PT. X <sup>9</sup>	Deny Kurniawan, Rusdi, Ratna Yuliawati, Khaidir Aulia (2020)	This study uses a type of analytical observational research using a cross sectional study.	Noise intensity and work fatigue	The population is the entire factory workforce totaling 73 people. The sample used was simple random sampling using the Slovin formula with a margin of error tolerance of 10%, obtained by 42 respondents.	Based on the results of the Chi Square statistical test, a p value = 0.002 ( $\alpha < 0.05$ ) was obtained, thus Ho was rejected and Ha was accepted, then it can be stated that there is a relationship between noise intensity and work fatigue in the factory workforce at PT. X.	Differences in the Location of the Research Site and sampling method, in this study using simple random sampling using the Slovin formula, while my research uses purposive sampling

<sup>9</sup> Journal of Public Health et al., "54 | Page The Relationship Between Noise Intensity and Fatigue in the Factory Section at PT. X Correlation Between Noise Intensity and Work Fatigue on the Factory Workforces in PT. X," n.d.

No	Heading	Writer	Research Design	Variable	Subject	Result	Research Differences
2	The Relationship Between Noise Intensity and Work Fatigue in Workers at the Palm Oil Mill (PKS) PT. X Rokan Hulu <sup>10</sup>	Hidayatul Fitria, Alfira Fitradika, Donny Haryxon, Sri Marhaeni (2023)	The research design uses analytical observational studies with a cross sectional approach, the sampling technique is carried out by means of total sampling, the data obtained are statistically tested using the chi-square test.	Noise and work fatigue	Workers at the Palm Oil Mill (PKS) of PT. X Rokan Hulu	The results of the chi-square statistical test obtained a value of p-value = 0.022 (p-value < 0.05), so it can be concluded that there is a relationship between noise intensity and work fatigue in workers at PKS PT. X Rokan Hulu in 2020.	Differences in the Research Site and in the sampling method using total sampling, while my research uses purposive sampling and in the research instrument for work fatigue using the KAUPK2 questionnaire, while in the research I use Reaction timer, Brand/ Type of Human Benchmark-Brain Application, Memory.

<sup>10</sup> Indah Yani Tambunan, "The Relationship Between Noise Intensity and Work Fatigue in Workers at the Palm Oil Mill (PKS) of PT. X Rokan Hulu."

No	Heading	Writer	Research Design	Variable	Subject	Result	Research Differences
3	Analysis of the Effect of Noise on Work Fatigue in Machine Operators at PT. PSU Kebun Tanjung Kasau <sup>11</sup>	Patimah Sari, Muhammad Zakaria, Cut Ita Erliana (2023)	The research design uses an analytical observational study with a cross sectional approach, data processing techniques and analysis are carried out by statistical methods.	Effect of Noise on Work Fatigue	The population of this study is 12 operators.	The effect of noise on fatigue can be expressed in the form of a simple linear regression equation, namely with the following equation: $Y' = a + bX$ $Y' = -21288.653 + 237.333X$ And for the correlation calculation, $r = 0.7$ is a positive value, meaning that there is a strong relationship or correlation between noise and work fatigue. The higher the noise level, the higher the level of work fatigue in employees.	There was a difference in the research method and in the research instrument method for work fatigue using a questionnaire, while in the research I used a Reaction timer, Brand/Type of Human Benchmark-Brain Application, Memory.

<sup>11</sup> "Matrix: Journal of Management & Industry-Production Engineering," n.d., <https://doi.org/10.350587/Matrik>.



No	Heading	Writer	Research Design	Variable	Subject	Result	Research Differences
4	Analysis of Noise Intensity on Work Fatigue of Production Operators at Pt Eob <sup>12</sup>	Jentry Octavianus Purba, Sri Zetli (2021)	This type of research is saturated sampling, data collection techniques are carried out by observation, testing data analysis using subjective metrics, such as Validity Test, Reliability Test, and Pearson Correlation Test.	Noise intensity with work fatigue	Production Operator at Pt Eob	The noise and fatigue variables were 0.794 and the significant value of 0 proved that the X variable and the Y variable had a correlation relationship by having a strong degree of relationship. Where the rate is in the interval of 0.61 – 0.80. It can be concluded that the higher the noise intensity will have an effect on the level of work fatigue..	The difference is in the sampling method This study uses saturated sampling, while my research uses purposive sampling and research place.

<sup>12</sup> Jentry Octavianus Purba and Sri Zetli, "Analysis of Noise Intensity on Work Fatigue of Production Operators at Pt Eob," *Journal of Coomassie* 5, no. 4 (2021).

No	Heading	Writer	Research Design	Variable	Subject	Result	Research Differences
5	Effect of Noise Intensity on Labor Fatigue in the Body and Frame Division <sup>13</sup>	Anisa Dwi Yanti (2020)	This study uses the Subjective Self Rating (SSRT) method as well as simple analysis and correlation calculations to find the relationship between the variables.	Noise intensity with work fatigue	Body and frame division	The results of statistical analysis with linear regression determined the value of $P = 0.000$ so that $P \leq 0.001$ and was declared very significant. This means that there is a very significant influence between noise intensity and work fatigue in the body and frame. $R = 0.857$ means that the influence of the independent variable (noise) on the dependent variable (fatigue) is 85.7%, while the remaining 14.3% is influenced by other variables. From the results of the calculation of the correlation between noise and work fatigue, a calculation of 0.857 was obtained. It can be concluded that the correlation between noise and work fatigue is very strong.	The difference in research on the method of fatigue data collection instrument using SSRT questionnaire and research location.

<sup>13</sup> Anisa Dwi Yanti, "The Effect of Noise Intensity on Labor Fatigue in the Body and Frame Division (Case Study: Body and Frame Workers Cv. Laksana Carousel)," n.d.