



(RESEARCH ARTICLE)



Analysis of the influence of noise and individual characteristics with non-auditory effects on workers of PT. X (Study at Lumajang factory)

Chossy Anggarahman Chrisna Putra * and Muhammad Farid Dimjati Lusno

Department of Environmental Health, Faculty of Public Health, Airlangga University, Surabaya, Indonesia.

World Journal of Advanced Research and Reviews, 2024, 21(01), 2807–2811

Publication history: Received on 19 December 2023; revised on 27 January 2024; accepted on 30 January 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.21.1.0353>

Abstract

PT X is one of the factories under the auspices of one of State-Owned Enterprises which manages sugar as the main commodity. This factory is one of the factories with modern sugar milling machines in the East Java area. One of the hazards of the work environment in the industry is noise. The purpose of this study was to analyze the influence between individual characteristics and non-auditory effects on employees exposed to noise in the PT X milling area. This type of research is observational with a cross sectional approach. Data collection was carried out at PT X in October 2023. The population of this study was 39 employees of the PT.X milling area. The independent variables in this study are individual characteristics (wearing ear protective equipment) and noise intensity. While the dependent variable in this study is non auditory effect complaints. Data were collected through questionnaire and measurement of noise intensity. The statistical test used was Spearman rho correlation test. The results showed that there was a correlation between APT compliance ($r = 0.332$) and noise intensity ($r = 343$) with complaints of non-auditory effects. Based on the results of the study, ear protective equipment (APT) or ear plug compliance and noise intensity have an influence on non-auditory effects. It is recommended that the company promotes the importance of using APT during the milling period in areas that have high noise intensity. In addition, there is a need for regulations regarding the use of APT to suppress the compliance of milling area employees to be more compliant with the use of APT.

Keywords: Non-Auditory effects; Individual Characteristics; Noise; Milling Area

1. Introduction

The work environment is the provision of production facilities and infrastructure, including equipment with decent and good conditions, raw materials that must be sufficiently available, adequate or representative workspace (both area, cleanliness, lighting, air temperature or good ventilation, room color, noise in the workplace) [1]. One of the hazards of the work environment in industry is noise. According to (Kemenaker No.51 of 1999 concerning Threshold Values of Physical Factors in the Workplace) Noise is all unwanted sounds that come from production process equipment and or work equipment that at a certain level can cause hearing loss [1]. Noise exposure limit is set at a threshold value of 85 dB for 8 hours per day [2].

Noise has both auditory and non-auditory effects and these effects can occur even when the intensity of the noise is not too high. Non-auditory effects occur because noise is perceived as a disturbing sound [3]. Psychological disorders caused by noise are characterized by increased emotions, discomfort, lack of concentration, stress, and insomnia. Noise-induced psychological disorders depend on the intensity, frequency, period, duration, and irregularity of the noise [4]. The communication disorder itself is caused by the masking effect (sound that masks hearing clearly). The result of the masking effect in industry is that workers can only communicate with other workers by raising their voices or shouting. Communication disorders can lead to impaired concentration, personality changes, reduce work capacity, cause disturbances related to relationships between workers, and cause stress reactions.

* Corresponding author: Chossy Anggarahman Chrisna Putra

PT X Jatiroto Lumajang Sugar Factory is a state-owned company that produces sugar using large and complex production machinery and equipment and has a high source of danger and risk that is closely related to occupational safety and health. The use of production machinery has the potential to cause noise that can result in non-auditory effects on the workforce. Based on the results of noise measurements that have been carried out by a third party for the milling area of PT X Jatiroto Lumajang Sugar Factory, the noise intensity is almost 85 dB in the factory area (75 - 81 dB). Long exposure to noise in the grinding area can cause auditory effects as well as non-auditory effects. It is influenced by external factors consisting of length of noise exposure, length of work, and noise intensity. As for the internal factors, they include compliance with using personal protective equipment, age, hobbies, smoking habits, health conditions, trauma and the use of drugs. Therefore, a study of individual characteristics and noise measurements was conducted to find out more about the relationship between noise exposure and individual characteristics with non-auditory effects of employees exposed to noise in 2023 at the PT X Jatiroto Lumajang milling area.

2. Material and methods

2.1. Material

This type of research is observational with a cross sectional design which includes quantitative and analytical research. The data used was primary and secondary data. The population of this study were all permanent employees exposed to noise in the milling area of PT X Jatiroto Sugar Factory Lumajang in 2023 amounting to 39 people who were also the sample in this study. The research location was at PT X Jatiroto Sugar Factory Lumajang, Kaliboto Lor Village, Jatiroto Sub-district, Lumajang Regency. Noise sampling points in two places, mill control panel area and boiler control panel area. The research time runs from June 2023 to November 2023.

2.2. Methods

Data analysis was carried out in two stages, namely univariate analysis, and bivariate analysis. Univariate analysis aims to explain or describe each research variable. This analysis was conducted on each variable. Bivariate analysis is an analysis conducted on two variables that are considered or suspected to have a relationship or correlation. [5]. The variables analyzed in this study are the relationship between compliance with the use of ear protective equipment (APT) and noise intensity with non-auditory effects using Pearson or Spearman data analysis (adjusted for normal distribution results).

3. Results and discussion

PT X is one of the factories under the auspices of one of State-Owned Enterprise which manages sugar as the main commodity. This factory is one of the factories with modern sugar milling machines in East Java. In the production process itself, the factory follows the growth of sugar cane seedlings until they are ready for harvest. This processing activity is called milling. The milling production process is carried out for approximately 4-6 months depending on the capacity of the sugar factory in each place under industry policies. Factory X has a milling capacity of up to 7000 TCD with raw materials in the form of sugar cane obtained from the factory's plantation and supported by sugar cane from the surrounding community plantations.

3.1. Individual Characteristics

3.1.1. Use of APT

The distribution of respondents based on the use of APT at PT X found that there were more respondents who always used APT than those who did not use APT. 22 people or 56.4% of respondents always used APT, while the remaining 17 respondents did not use APT (Table 1).

Table 1 Distribution of Respondents Based on APT Usage at PT. X

Category	Frequency	Percentage
Never	17	43.6
Always	22	56.4
Total	39	100.0

3.1.2. Noise Intensity

The distribution of respondents based on noise intensity at PT X found that there are 2 categories of noise intensity values coming from 2 different locations. Location 1 is the control room area of the mill station which has a noise level of 69.2 dB where there are 18 respondents at that location. Location 2 is the boiler station control room area which has a noise level of 66.89 dB where there are 21 respondents at that location (Table 2).

Table 2 Distribution of Respondents Based on Noise Intensity at PT. X

Category	Frequency	Percentage
66.89	21	53.8
69.20	18	46.2
Total	39	100.0

3.1.3. Non-Auditory Complaints

From the three elements of non-auditory effect complaints used, namely communication disorders, physiological disorders, and psychological disorders, the overall total sum value of each non-auditory complaint is categorized in the assessment:

- Severe complaints if the total assessment score is (24-39)
- Moderate complaints if the total assessment score is (40-55)
- Mild complaints if the total assessment score is (56-72)

The distribution of respondents based on non-auditory effects at PT X found that there were 2 categories of non-auditory effects in all respondents, namely mild and moderate categories. Most respondents experienced mild complaints, namely 31 people, while 8 other people experienced moderate complaints (Table 3).

Table 3 Distribution of Respondents by Effect Non-Auditory APT at PT. X

Category	Frequency	Percentage
Mild	31	79.5
Moderate	8	20.5
Total	39	100.0

3.2. Cross Tabulation Between Individual Characteristics and Non-Auditory Complaints

3.2.1. Relationship between APT Usage and Non-Auditory Effects

Based on the results of the Spearman Rho correlation statistical test, the 2-tailed significance value is 0.046. This figure is smaller than 0.05 so it can be concluded that there is a significant relationship between the use of APT and non-auditory effects. The resulting correlation coefficient is -0.322 so that it can be interpreted that the relationship between APT usage and non-auditory effects is opposite or inversely proportional to the level of strength of the relationship which is quite strong. The use of APT can reduce non-auditory complaints of respondents or employees of PT X (Table 4).

These results explain that the use of APT can reduce non-auditory complaints from workers at PT. X. This is different from the results of research by Indrayani, et al. (2020) and Sumadika, et al. (2020) which stated that there was no relationship between APT usage and non-auditory complaints [6], [7]. Astuti's research (2019) explains that workers who do not use ear protective equipment have a risk of experiencing psychological disorders 4 times greater than workers who use Ear Protective Equipment [8].

Cotton earplugs can reduce noise by 10 - 15 dBA [9]. APT in the form of ear plugs can theoretically reduce noise by 8 - 30 dBA and ear muffs can reduce noise by 25 - 40 dBA [10]. The reason for the difference in the findings of this study with previous studies is the possibility that APT in the form of ear plugs and earmuffs is reduced in effectiveness because

it is not fully used correctly, the size and shape of the APT does not match the user, or the condition of the APT is not good/damaged.

Table 4 Correlation Test Results APT Usage with Non-Auditory Effect

Correlations				
			Non-Auditory Effect	APT
Spearman's rho	Non-Auditory Effect	Correlation Coefficient	1.000	-0.322*
		Sig. (2-tailed)	-	0.046
		N	39	39
	APT	Correlation Coefficient	-0.322*	1.000
		Sig. (2-tailed)	0.046	-
		N	39	39

*. Correlation is significant at the 0.05 level (2-tailed).

3.2.2. Relationship between Noise Intensity and Non-Auditory Effects

Based on the results of the Spearman Rho correlation statistical test, the 2-tailed significance value is 0.033. This figure is smaller than 0.05 so it can be concluded that there is a significant relationship between noise intensity and non-auditory effects. The resulting correlation coefficient is 0.343, which means that the relationship between noise intensity and non-auditory effects is unidirectional with a strong level of relationship strength. The higher the noise level of a location can increase the non-auditory complaints of respondents or employees of PT X, and vice versa (Table 5).

This is in accordance with the results of research by Indrayani, et al. (2020) which states that there is a relationship between noise intensity level and nonauditory complaints [6]. The results of this study explain that respondents who work in noisy workplaces experience a 5.556 times greater risk of non-auditory effect complaints than respondents who work in a place that is not noisy. However, research by Sumadika, et al. (2020) explains that there is no significant relationship between noise and non-auditory. obtained a p-value of 0.759 (p-value> 0.05) which means that statistically the indicator of the absence of a relationship between the two variables [7].

Table 5 Correlation Test Results of Noise Intensity with Non-Auditory Effects

Correlations				
			Non-Auditory Effects	Noise
Spearman's rho	Non-Auditory Effects	Correlation Coefficient	1.000	0.343*
		Sig. (2-tailed)	-	0.033
		N	39	39
	Noise	Correlation Coefficient	0.343*	1.000
		Sig. (2-tailed)	0.033	-
		N	39	39

*. Correlation is significant at the 0.05 level (2-tailed).

According to Ridley in Indrayani, et al. (2020), exposure to excessive noise can cause lack of concentration, loss of balance and disorientation (related to the effect of noise on the fluid in the semicircular canal of the inner ear) as well as fatigue [6]. This is what triggers complaints of non-auditory effects on workers that cause communication disorders due to reduced hearing ability, psychological disorders, and physiological disorders due to fatigue.

4. Conclusion

Based on the results of the research conducted, it can be concluded that to the employees of the PT X milling area, it can be concluded that there is a strong enough correlation between the use of APT and non-auditory effects with the resulting correlation coefficient of -0.322 with an inversely proportional direction and there is a strong enough correlation between noise intensity and non-auditory effects with a correlation coefficient of 0.343 with a unidirectional correlation direction.

References

- [1] “Keputusan Menteri Tenaga Kerja No KEP-51/MEN/1999 Tahun 1999 Tentang Nilai Ambang Batas Faktor Fisika Di Tempat Kerja”.
- [2] International Labour Organization, “The Prevention of Occupational Diseases - World Day for safety and health at work 28 April 2013,” 2013.
- [3] Nawawinetu, *Higiene Perusahaan*. Surabaya: Universitas Airlangga, 2007.
- [4] B. A. Gunawan and M. Marsum, “Deskripsi Intensitas Suara Pada Unit Raw Mill Pt. Holcim Indonesia Tbk. Cilacap,” *Bul. Keslingmas*, vol. 34, no. 3, pp. 213–219, 2015.
- [5] Notoatmodjo, *Metodologi Penelitian Kesehatan*. Jakarta: Rineka Cipta, 2015.
- [6] R. Indrayani *et al.*, “Hubungan Paparan Kebisingan dengan Keluhan Subyektif Non-Auditory pada Pekerja Konstruksi PT. X Kabupaten Gresik,” *J. Ilmu Kesehat. Masy.*, vol. 16, no. 2, pp. 67–76, 2020.
- [7] D. M. Sumadika, A. Asnifatima, and A. Fathimah, “Hubungan Paparan Kebisingan Dengan Gangguan Non-Auditory Pada Pekerja Di Pt X Bekasi Tahun 2019,” *PROMOTOR*, vol. 3, no. 4, pp. 324–333, 2020.
- [8] A. D. Lestari, “Hubungan paparan kebisingan terhadap efek kesehatan non-auditory pada pekerja bagian produksi di PT. Tokai Dharma Indonesia pada Tahun 2013,” Universitas Indonesia, 2013.
- [9] Darlani and Sugiharto, “Kebisingan dan Gangguan Psikologis Pekerja Weaving Loom dan Inspection PT. Primatexco Indonesia,” *J. Heal. Educ.*, vol. 2, no. 2, pp. 130–137, 2017.
- [10] A. Panggeleng, “Faktor Yang Berhubungan Dengan Gangguan Fungsi Pendengaran Pekerja Pada Bagian Produksi PT Makassar Tene,” Universitas Hasanuddin, 2018.