The Relationship of Stress Levels to Noise Exposure

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Abstract: This study aims to examine the relationship between stress levels and noise exposure among furniture workers. This study is an analytical descriptive research with a cross-sectional study design approach. The research location is at a furniture workshop in the Pahandut Seberang area of Palangka Raya. The study population consists of all workers in the furniture workshop in Pahandut Seberang and residents within a 100-meter radius of the workshop, who are considered to be at risk of noise exposure. The sample for this study was taken using a random sampling method. Data analysis was conducted using the Chi-square test, with a confidence level of 95% (p = 0.05), and the results are considered significant if $p \leq 0.05$. The results showed $p < 0.05$, with a p-value of 0.004, indicating that there is a significant relationship between noise exposure and stress levels among workers and residents in the furniture workshop area of Pahandut Seberang. This result suggests that exposure to noise above 85 dBA may have a significant impact on stress levels in this population.

Keywords: Exposure; Furniture workers; Stress; Noise

Introduction

WHO in all regions of the World the level of work noise is still a problem (Budiawan et al., 2016; Kwong et al., 2023). For example, in the United States (US), more than 30 million workers are exposed to harmful noise (Rachman, 2018). Furthermore, in Germany, 4 to 5 million people (12−15% of the workforce) are exposed to dangerous levels of noise (Burns et al., 2019; Indriyanti et al., 2019; Sukmawati et al., 2018). In Indonesia itself, based on research conducted at the Surabaya Pet Food Production Plant, involving 34 respondents who were used as a research sample, the results were obtained from 34 workers, 15% were declared to have low levels of work stress, 59% were declared to have moderate levels of stress, and 26% were declared to have high levels of work stress. In Indonesia itself, work stress is also a problem with a fairly high number (Aulia et al., 2019). Although there is no official data yet, several studies have been conducted related to work stress. As in Kamso (2011) that in Jakarta the incidence of stress reached 25% in young executives. One of the sources of

work stress is from work Experts agree that the tolerance limit for noise exposure during an 8-hour. Over time, however, complaints of hearing difficulties may arise, which can be very bothersome and seen as a significant inconvenience (Hahad et al., 2019; Münzel et al., 2018; Priyanto et al., 2023; Smith et al., 2004; Yusmardiansyah & Zhara, 2019). In addition to its effects on hearing, workers exposed to loud noise also report symptoms such as nausea, weakness, stress, headaches, and even increased blood pressure (Kementerian Ketenagakerjaan Republik Indonesia, 2018). There are concerns about whether noise exposure can lead to permanent conditions, such as high blood pressure.

Stress is a condition caused by uncontrolled social, environmental, and physical demands (Apladika et al., 2016; Bidel et al., 2022; Münzel et al., 2018). It is one of the leading causes of sleep disturbances because, during stress, the body experiences an increase in certain hormones that affect the central nervous system, leading to heightened alertness and a state of wakefulness. This can negatively impact the quality of sleep (Chaharaghran et al., 2022; Faria et al., 2022; Tao et al.,

2020). These hormonal changes influence both Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM) sleep cycles, often causing individuals to wake up frequently at night and experience nightmares. The prevalence of stress among university students worldwide ranges from 38-71%, while in Asia, it ranges from 39.6 to 61.3%.

Sleep quality refers to a person's satisfaction with their sleep and whether they get an adequate amount of sleep to meet their needs (Lara & Vasconcelos, 2021). Several factors can affect sleep quality, such as illness, fatigue, environment, lifestyle, alcohol or drug use, nutrition, and stress. Good sleep quality is characterized by the absence of sleep deprivation signs and the absence of sleep problems. Key aspects of good sleep quality include sleep duration, sleep latency, and subjective sleep experience. According to the International Sleep Disorder Association, the prevalence of sleep disturbances is due to factors such as restlessness (5-15%), alcohol dependence (10%), delayed sleep (10%), schedule changes (2-5%), illness (< 1%), and stress (65%). Based on the above explanation, workers exposed to noise are at risk of experiencing stress, which can negatively impact their sleep quality, hearing, heart rate, and blood pressure, all of which are additional risk factors.

Method

This study is an analytical descriptive research with a cross-sectional study design approach. The research location is at a furniture workshop in the Pahandut Seberang area of Palangka Raya. The study population consists of all workers in the furniture workshop in Pahandut Seberang and residents within a 100-meter radius of the workshop, who are considered to be at risk of noise exposure. The sample for this study was taken using a random sampling method. Data analysis was conducted using the Chi-square test, with a confidence level of 95% (p = 0.05), and the results are considered significant if p ≤ 0.05.

Result and Discussion

The questionnaire provided by the researcher to the respondents consists of 42 questions, which are based on the Depression Anxiety Stress Scale 42 (DASS 42). Table 1 shows the distribution of respondents exposed to noise and those not exposed to noise. In this study, if the noise exposure is less than 85 dBA (Non-risk), it is considered non-risk, while if the exposure exceeds 85 dBA (Risk), it is considered a risk.

Table 1. Distribution of respondents with noise exposure in furniture in the work area of Pahandut Seberang Village

Noise Exposure	Frequency	Percentage (%)
Risk (> 85 dBA)	19	63.33
No Risk (< 85 dBA)	11	36.67
Total	30	100

The following presents the frequency of stress levels assessed using the Depression Anxiety Stress Scale 42 (DASS 42) questionnaire. Based on the results, it was found that 17 respondents (56.67%) scored within the "Normal" range (0-14), indicating no significant stress. Meanwhile, 5 respondents (16.67%) experienced mild stress, with scores ranging from 15 to 18. A total of 6 respondents (20%) reported moderate stress, with scores between 19 and 25, while 2 respondents (6.66%) were categorized as having severe stress, with scores ranging from 26 to 33. Notably, no respondents fell into the "Very Severe" category, which would correspond to a score above 34. These results reflect the distribution of stress levels among the respondents, with the majority falling within the normal or mild stress categories.

Table 2. Distribution of respondents with stress level in furniture in the work area of Pahandut Seberang Village

Noise Exposure	Frequency	Percentage (%)
Normal (0–14)	17	56.67
Light (15–18)	5	16.67
Keep (19–25)	6	20
Severe (26–33)	2	6.66
Very Severe (> 34)	0	0
Total	30	100

Table 3. Results of analysis of noise exposure and stress level variables

Noise Intensity	Normal n (%)	Mild n (%)	Medium n (%)	Severe (%)	Very Severe (%)	Total n (%)	P value
Risk (>85 dBA)	6 (35.29)	5 (100)	6 (100)	2 (100)	0 (0)	19 (63.33)	
No Risk (<85 dBA)	11 (64.7)	0 (0)	0 (0)	0 (0)	0 (0)	11 (36.67)	0.004
Total	17 (56.67)	5 (16.67)	6 (20)	2 (6.66)	0 (0)	30 (100)	

Discussion

Based on the research findings, it was found that among the 19 respondents exposed to risk-level noise intensity (> 85 dBA), there were 6 respondents (35.29%) who did not experience stress, 5 respondents (100%) who experienced mild stress, 6 respondents (100%) who experienced moderate stress, and 2 respondents (100%) who experienced severe stress. On the other hand, among the 11 respondents exposed to non-risk-level

noise intensity (< 85 dBA), all of them did not experience stress.

From the above research results, a p-value of < 0.005 was obtained, indicating a significant relationship between stress levels and noise exposure among workers and residents in the furniture workshop area of Pahandut Seberang. This finding is consistent with research conducted by Yusmardiansyah & Zhara (2019), which stated that there is a relationship between noise and work stress at PT. Mitra Bumi.

Noise continues to be one of the serious environmental issues that can lead to health problems, such as cardiovascular diseases, sleep disturbances, cognitive impairment, hearing loss, and annoyance. The Minister of the Environment's Decree No. Kep-48/MENLH/11/1996 sets the noise level standard for office and commercial areas at 65 dBA and for industrial areas at 70 dBA. The Minister of Manpower's Decree No. Kep-51/MEN/1999 on the threshold limit values of physical factors in the workplace sets the Threshold Limit Value (TLV) for noise at 85 dBA for a maximum of 8 hours per day or 40 hours per week.

Noise can be defined as an unwanted sound that disrupts hearing and even reduces the hearing ability of those exposed to it (Abdullah et al., 2020). Noise can affect concentration and cause accidents. Noise levels above 85 dBA can affect hearing . Preventive measures against noise should start from the planning stage of machinery and continue with the installation of sound-absorbing materials (Hasibuan et al., 2022). Exposure to noise in the workplace can stimulate the release of "stress hormones" such as catecholamines and cortisol (Fadhli et al., 2015). The release of these hormones activates the body's stress mechanisms and can lead to mood disturbances if other physiological stimuli are present. Sudden, unpredictable, and previously unrecognized noise exposure can trigger the body's fight-or-flight response, orientation response, and startle reflex. These responses are protective reactions to the perceived threat of noise.

The interaction between workers and their working conditions can also serve as the basis for work stress, where worker characteristics and work conditions are factors that contribute to the development of work stress. Noise in the workplace is just one of the hazards associated with work stress, resulting from a lack of control over the work environment (McCullagh et al., 2022; Schmidt et al., 2020; Wiediartini & Dermawan, 2019). It should not be considered the primary cause of work stress in noisy environments, and other factors need to be evaluated to address the issue of work-related stress (Amar et al., 2019; Faria et al., 2022; Nichols et al., 2015).

Conclusion

The characteristics of the respondents based on age in this study are as follows: 8 respondents (26.67%) are aged 26-35 years, 14 respondents (46.66%) are aged 36-45 years, and 8 respondents (26.67%) are aged 46-55 years. The educational background of the respondents is as follows: 23 respondents (76.67%) have completed elementary school (SD), 5 respondents (16.66%) have completed junior high school (SMP), and 2 respondents (6.67%) have completed high school/vocational school (SMA/SMK). Regarding noise exposure, the study found that 19 respondents (63.33%) were exposed to risk-level noise (> 85 dBA), while 11 respondents (36.67%) were not exposed to risk-level noise (< 85 dBA). For stress levels, 17 respondents (56.67%) reported not experiencing stress, 5 respondents (16.67%) experienced mild stress, 6 respondents (20%) experienced moderate stress, and 2 respondents (6.66%) experienced severe stress. The study used the Chi-Square test to analyze the relationship between noise exposure and stress levels. The results showed $p < 0.05$, with a p-value of 0.004, indicating that there is a significant relationship between noise exposure and stress levels among workers and residents in the furniture workshop area of Pahandut Seberang. This result suggests that exposure to noise above 85 dBA may have a significant impact on stress levels in this population.

Conflicts of Interest
The authors declare no conflict of interest.

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