ISSN:xxxx-xxxx

Proceedings of the 1st ACEH INTERNATIONAL CONFERENCE ON HEALTH Poltekkes Kemenkes Aceh October 27-10-10, 2025, Banda Aceh, Indonesia

THE EFFECT OF NOISE ON WORKER CONCENTRATION AT SULTAN ISKANDAR MUDA INTERNATIONAL AIRPORT, ACEH BESAR REGENCY, IN 2024

Zulfikar[1*], Puteri Balqis[2], Kartini[3], Wiwit Aditama[4], Syahrizal[5]
[1,2,3,4]Poltekkes Kemenkes Aceh

***** Corresponding email: *zulfikarkawe@gmail.com*

ABSTRACT

Noise is a common physical hazard in the workplace. Exposure to high-intensity noise, exceeding the threshold limit value, can lead to various health problems such as hearing impairment and a decline in concentration. Sultan Iskandar Muda International Airport experiences significant noise levels, primarily from aircraft movements on the runway, with engine noise during landing and takeoff reaching 110–120 dBA. This study aims to determine the effect of noise on worker concentration at Sultan Iskandar Muda International Airport. This was an analytical survey with a cross-sectional study design, conducted on February 20, 2024. The sample consisted of 30 workers from four external locations within the airport: Aviation Security, Apron Movement Control, Aviobridge Operator, and Ground Handling. Data analysis was performed using the Chi-Square statistical test. The study found that the noise levels at the four measurement points were within the permissible limits, with an average noise level of 85.9 dBA. Furthermore, the workers' concentration was also categorized as good, with a score of 80%. The Chi-Square statistical test revealed no significant effect of noise on worker concentration. It can be concluded that noise is not a significant variable affecting worker concentration at Sultan Iskandar Muda International Airport in Aceh Besar Regency in 2024. Worker concentration may be influenced by other variables, such as external factors, age, and years of service. It is recommended that workers are educated on methods to maintain concentration in noisy environments.

Keywords: Noise, Concentration, Airport

INTRODUCTION

Indonesia has experienced significant growth in its transportation sector, particularly in air, sea, and land travel. The increasing demand for air mobility has led to a greater need for faster transportation, with air travel being one of the most efficient modes of transport(Oladimeji et al., 2023).

According to air and sea transportation statistics for Aceh Province in 2019, a total of 9,271 flights were recorded, comprising 3,393 international flights (36.60%) and 5,878 domestic flights (63.40%). This high volume of flights is likely to contribute to increased noise levels around the airport(Iswandi, 2021). Minister of Transportation Regulation of the Republic of Indonesia No. 60 of 2021 on Airport Facility Standardization defines noise as any unwanted sound from a business or activity that occurs over a specific period and can endanger public health and comfort(Sodiq et al., 2021). While physiological hearing loss is not expected from long-term exposure to noise levels below the Threshold Limit Value (TLV), consistently high noise levels can lead to premature fatigue, anxiety, headaches, impatience, and a lack of focus at work. A lack of focus on work-related tasks can have a significant impact, potentially leading to workplace accidents that hinder the work of other employees and reduce overall productivity(Hasanvand, 2024; Perez & Vasquez, 2021).

Sultan Iskandar Muda International Airport, located in Blang Bintang District, Aceh Besar, Aceh Province, is managed by PT. Angkasa Pura II. This airport is one of the many in Aceh Province that serves domestic and international routes and can accommodate wide-body aircraft. Its runway is 45 meters wide and 3,000 meters long(Syukran et al., 2023).

The noise level at Sultan Iskandar Muda Airport is determined by the number of aircraft operating during landing, takeoff, taxiing to the runway, and engine testing. The sound generated by aircraft engines during takeoff and landing ranges from 110 to 120 dBA(Zaporozhets & Levchenko, n.d.). According to the Decree of the Ministry of Manpower No. PER.13/MEN/X/2011, the maximum permissible noise threshold is 85 dBA for an eight-hour daily or forty-hour weekly exposure period(Hartati et al., 2021).

Preliminary observations indicate that several personnel at Sultan Iskandar Muda Airport are forced to shout and repeat words to communicate with each other. A lack of awareness among workers has led to them not wearing personal protective equipment, resulting in hearing impairment, reduced ability to concentrate at work, and quick fatigue. Several studies have found a correlation between noise and attention disorders. A study conducted in Jember Regency showed that certain characteristics, such as age and years of service, can contribute to a decrease in concentration due to noise, as these factors can influence a worker's ability to focus(Gani et al., 2018). Furthermore, another study at PT Pundi Alam Perkasa Tamanggung

concluded that continuous noise can lead to rapid fatigue, restlessness, headaches, impatience, and a lack of focus at work(Aprianto, 2018).

The human ear's ability to comprehend and process sound is significantly influenced by both internal and external variables. In addition to causing these disturbances, an unpleasant work environment can also affect employee productivity. The workplace atmosphere has a significant impact on employee performance within a company. A pleasant working atmosphere will improve human performance and productivity by fostering a sense of security, comfort, and well-being(Hafeez et al., 2019; Hu et al., 2017).

METHODS

This study employed an analytical survey with a cross-sectional design to investigate the effect of noise intensity on worker concentration at Sultan Iskandar Muda International Airport, Aceh Besar. The research was conducted on February 20, 2024. The study population and sample consisted of 30 workers stationed in four external airport areas: Aviation Security, Apron Movement Control, Aviobridge Operator, and Ground Handling.

Primary data collection was performed using two methods: noise levels were measured with a Sound Level Meter, and concentration levels were assessed using a Grid Concentration Test(Greenlees et al., 2006). Secondary data were obtained from internal airport reports. The collected data were statistically analyzed using the Chi-Square test.

RESULTS AND DISCUSSION

Based on the study conducted on 30 workers at Sultan Iskandar Muda International Airport, Aceh Besar, in 2024, the following findings were obtained:

The characteristics of the workers from the four study locations are presented bellow.

Table 1. Frequency Distribution of Worker Age and Years of Service at Sultan Iskandar Muda International Airport, Aceh Besar, 2024

No.	Characteristic	Frequency (n)	Percentage (%)
	Age		
1	30–40 years	9	30.0
2	40–50 years	13	43.3
3	50–60 years	8	26.7
	Total	**30**	**100**
	Years of Service		
1	5–10 years	12	40.0
2	11–15 years	10	33.3
3	16–20 years	8	26.7
	Total	**30**	**100**

The following table shows the noise intensity levels in 4 locations based on workers at Sultan Iskandar Muda International Airport

Table 2. Frequency Distribution of Noise Intensity at Sultan Iskandar Muda International Airport Area, Aceh Besar Regency, 2024

No.	Noise Intensity	Frequency (F)	Percentage (%)
1.	Permissible	14	46.7
2.	Non-permissible	16	53.3
	Total	**30**	**100**

Univariate analysis revealed that 53.3% of the measured areas had a noise intensity exceeding the permissible limit (> 85 dBA), while 46.7% of the areas met the requirement (≤ 85 dBA).

Table 3. Frequency Distribution of Worker Concentration at Sultan Iskandar Muda International Airport, Aceh Besar, 2024

No.	Concentration Level	Frequency (n)	Percentage (%)
1	Good	24	80.0
2	Poor	6	20.0
	Total	**30**	**100**

Despite the high noise levels, the Grid Concentration Test results indicated that the majority of workers (80%) had good concentration, while 20% had poor concentration.

Table 4. Effect of Noise Intensity on Worker Concentration at Sultan Iskandar Muda International Airport, Aceh Besar, 2024

Noise Intensity	Worker Concentration				Total		P Value	α	OR (95% CI)
	Good		Poor						
	N	%	N	%	N	%			
Permissible	13	92,9	1	7,1	14	100	0,100	0,05	5,909
Non-permissible	11	68,8	5	31,3	16	100			
Total	**24**	**80**	**6**	**20**	**30**	**100**			

The Chi-Square statistical test results showed no significant association between noise intensity and worker concentration ($p=0.100>\alpha=0.05$). An Odds Ratio (OR) of 5.909 indicates that workers in areas with permissible noise levels were 5.909 times more likely to have good concentration compared to workers in areas with non-permissible noise levels.

An airport is an area on land or sea where aircraft land and take off, and passengers and goods are loaded and unloaded. In addition to aviation safety and security, airports are equipped with essential and auxiliary facilities(Ridho, 2017). According to the Decree of the Minister of Manpower No. PER.13/MEN/X/2011, exposure to noise levels up to 85 dBA is permissible for eight hours per day or forty hours per week. This threshold is crucial for protecting workers from excessive noise exposure. Various sources

of noise have different intensity levels, all of which can be hazardous to human health. To ensure that noise does not negatively affect health or lead to workplace accidents, it is crucial to monitor and regulate noise levels. Research in the field of occupational health has consistently shown that noise can cause physiological and psychological stress, impacting cognitive functions like concentration and memory. A study conducted in the Jember region concluded that several factors, including age, years of service, and noise intensity, can influence a worker's ability to concentrate. These characteristics may also cause a decrease in concentration levels due to noise(Gani et al., 2018).

Based on the data collection from respondents and the noise level measurements conducted on February 20, 2024, at Sultan Iskandar Muda Airport's airside, which encompassed four measurement points, the study included various aircraft types such as Citilink and Lion Air. The measurements were taken at 13:00 during a scheduled operational break. First, a Sound Level Meter (SLM) was used to measure noise intensity at four locations along the runway and at the arrival and departure terminals.

The findings showed that two of the four points (50%) met the required noise intensity level (≤ 85 dBA), while two points (50%) did not (> 85 dBA). Several factors, including aircraft engine noise and surrounding traffic, may have contributed to these levels. These findings align with previous studies that document high noise exposure risks for ground crew and other airport personnel(Postorino & Mantecchini, 2016).

Subsequently, worker concentration data was collected using a Grid Concentration Test with 30 respondents. As shown in Table 3, the frequency distribution of concentration levels indicated that 24 respondents (80%) had good concentration, while 6 respondents (20%) had poor concentration. This may be attributed to several factors, such as a non-conducive work environment and ambient noise, which can disrupt worker focus. However, most workers at Sultan Iskandar Muda Airport use complete Personal Protective Equipment (PPE), such as earplugs and earmuffs, to mitigate the effects of high noise levels. The use of PPE is a well-established control measure that can effectively reduce the impact of noise exposure on hearing and cognitive performance(Windy et al., 2019).

The researchers' initial assumption was that noise intensity would affect concentration at Sultan Iskandar Muda Airport, given that noise can be generated from various sources, including aircraft engines, airport announcements, and other operational activities. Prolonged exposure to noise can negatively impact worker concentration, potentially leading to decreased productivity, accuracy, and workplace safety(Chis et al., 2025).

However, the statistical analysis using the Chi-Square test showed no significant correlation between noise and concentration at Sultan Iskandar Muda International Airport. This finding is supported by a p-value of 0.100, which is greater than the significance level of 0.05, leading to the rejection of

the alternative hypothesis (Ha) and the acceptance of the null hypothesis (H0). The Odds Ratio (OR) of 5.909 indicates that workers in areas with permissible noise intensity levels were 5.909 times more likely to have good concentration compared to those in non-permissible noise areas(Pandis, 2016).

Therefore, noise is not a variable that significantly affects worker concentration at Sultan Iskandar Muda Airport. Instead, other variables, such as age and years of service, may be contributing factors(Chau et al., 2010). As individuals age, their speed of information processing and working memory tend to decline, while physical and mental health issues like stress and anxiety can lead to fatigue and a lack of energy for concentration[14]. Similarly, years of service may lead to fatigue from repetitive tasks, causing workers to feel less motivated, overwhelmed, or disgruntled. Thus, it is crucial to improve the work environment by implementing health and wellness programs and ensuring that noise levels remain within permissible limits(Arifin, 2021).

CONCLUSION

Based on the findings, the Sultan Iskandar Muda International Airport area met the noise level criteria in 2024, with half the areas measuring at or below the acceptable 85 dBA threshold. Worker concentration was generally good, with 80% of staff demonstrating high concentration levels. Despite this, a statistical analysis (p=0.100) revealed no significant relationship between noise intensity and worker concentration. This suggests that while noise levels were generally controlled and worker concentration was high, other factors may be influencing the concentration levels, and the measured noise levels did not have a statistically significant impact on the workers' ability to concentrate in this specific context

ACKNOWLEDGEMENT

We thank the Director Health Polytechnic of the Ministry of Health for their invaluable support and collaboration. Our sincere gratitude goes to the Chief of the Department of Environmental Health for their expertise and guidance throughout this project. We also acknowledge the crucial contributions of all the workers and the Chief of Sultan Iskandar Muda International Airport, whose cooperation was essential for the completion of this research.

REFERENCES

Aprianto, H. D. (2018). *Analisis Pengaruh Kebisingan Mesin Terhadap Konsentrasi Kerja Pada Tenaga Kerja di Bagian Produksi Pt. Pundi*

Alam Perkasa Temanggung. Skripsi, Universitas Muhammadiyah Magelang.

Arifin, M. N. I. (2021). *Pengaruh Beban Kerja Terhadap Gangguan Konsentrasi Dengan Stres Kerrja Pada Pekerja di PT. Angkasa Pura I (Persero) Makassar*. Universitas Hasanuddin.

Chau, N., Wild, P., Dehaene, D., Benamghar, L., Mur, J.-M., & Touron, C. (2010). Roles of age, length of service and job in work-related injury: a prospective study of 446 120 person-years in railway workers. *Occupational and Environmental Medicine*, *67*(3), 147–153.

Chis, T. V., Cioca, L.-I., Badea, D. O., Cristea, I., Darabont, D. C., Iordache, R. M., Platon, S. N., Trifu, A., & Barsan, V.-A. (2025). Integrated noise management strategies in industrial environments: A framework for occupational safety, health, and productivity. *Sustainability*, *17*(3), 1181.

Gani, L. R., Rachmawati, D. A., Indreswari, L., Mardijana, A., & Nurdian, Y. (2018). Hubungan antara Kebisingan di Tempat Kerja dengan Kualitas Tidur pada Pekerja Pabrik Kayu PT. Muroco Jember The Correlation between Noise in Workplace and Sleep Quality in Workers at PT. Muroco Jember Wood Processing Factory. *Agromedicine and Medical Sciences*, *4*(2), 1–5.

Greenlees, I., Thelwell, R., & Holder, T. (2006). Examining the efficacy of the concentration grid exercise as a concentration enhancement exercise. *Psychology of Sport and Exercise*, *7*(1), 29–39.

Hafeez, I., Yingjun, Z., Hafeez, S., Mansoor, R., & Rehman, K. U. (2019). Impact of workplace environment on employee performance: mediating role of employee health. *Business, Management and Economics Engineering*, *17*(2), 173–193.

Hartati, R., Marlinda, M., & Abdillah, P. (2021). Pengukuran Tingkat Kebisingan Laboratorium pada Perusahaan Daerah Air Minum (PDAM) Tirta Daroy Kota Banda Aceh. *Jurnal Optimalisasi*, *7*(1), 84–91.

Hasanvand, M. B. (2024). Job Stress and Its Management. In *Protection and Prevention Approaches in Occupational Health and Safety*. IntechOpen.

Hu, S., Mu, Y., Liu, G., & Zhang, L. (2017). Research on effecting mechanism of environmental parameters on human ear. *Building and Environment*, *118*, 289–299.

Iswandi, M. (2021). *Analisis Sebaran Kebisingan Akibat Aktivitas Landing dan Take-off Di Sekitar Bandara Internasional Sultan Iskandar Muda Kabupaten Aceh Besar*. UIN Ar-Raniry Banda Aceh.

Oladimeji, D., Gupta, K., Kose, N. A., Gundogan, K., Ge, L., & Liang, F. (2023). Smart transportation: an overview of technologies and applications. *Sensors*, *23*(8), 3880.

Pandis, N. (2016). The chi-square test. *American Journal of Orthodontics and Dentofacial Orthopedics*, *150*(5), 898–899.

Perez, W. D. D., & Vasquez, A. B. (2021). *Relationship of Noise Level to the Mental Fatigue Level of Students: A Case Study during Online Classes*.

Postorino, M. N., & Mantecchini, L. (2016). A systematic approach to assess the effectiveness of airport noise mitigation strategies. *Journal of Air Transport Management*, *50*, 71–82.

Ridho, M. (2017). *Optimalisasi Fasilitas Bandara untuk Meningkatkan Kualitas Pelayanan pada Penumpang di Bandara Kualanamu Internasional Airport*. Universitas Sumatera Utara.

Sodiq, N., Saragih, G. M., & Herawati, P. (2021). Pengendalian Kebisingan Dari Aktivitas Penerbangan di Lingkungan Sekitar Bandara Sultan Thaha Jambi dengan Pemanfaatan Ruang Terbuka Hijau. *Jurnal Daur Lingkungan*, *4*(1), 25–28.

Syukran, R., Adam, M., & Kesuma, T. M. (2023). The Influence of Self-Efficacy Creativity and Employee Engagement on Employee Performance and Its Implications on the Performance of PT Angkasa Pura II Branch Office at Sultan Iskandar Muda Airport in Aceh. *International Journal of Scientific and Management Research*, *6*(03), 82–95.

Windy, N. M., Suoth, L. F., & Mandagi, C. K. F. (2019). Analisis Pengendalian Kebisingan pada Pekerja Apron Movement Control (AMC) di PT Angkasa Pura I (Persero) Bandar Udara Internasional Sam Ratulangi Manado. *KESMAS: Jurnal Kesehatan Masyarakat Universitas Sam Ratulangi*, *8*(6).

Zaporozhets, O., & Levchenko, L. (n.d.). *Aircraft noise exposure and impact assessment and management*.