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THE ERGONOMIC RISK AMONG TRADES AT CONSTRUCTION SITE IN MALAYSIA

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Abstract— The construction sector exposes tradespeople to high risks of accidents and ergonomic hazards, such as awkward postures, repetitive tasks, loud noise, vibrations, and extreme temperatures. These conditions increase the likelihood of ergonomic harm and Work-related Musculoskeletal Disorders (WMSDs). This study identifies key ergonomic risks through a questionnaire survey conducted among workers on selected residential sites, with data analyzed using SPSS software. Findings show that awkward postures, task repetition, and extreme temperatures are the primary risks. These insights highlight important safety concerns and can help improve

safety protocols and regulations to protect construction workers' health and well-being.

I. Introduction

The construction industry is a major part of the Malaysian economy but is also highly accident-prone. Workers face hazardous site conditions that often result in serious injuries or fatalities [1]. Research by [2] shows that large projects frequently encounter these risks, impacting safety performance. Accidents are often linked to factors unique to construction, such as human behaviour [3], poor site conditions, hazardous activities [4], and unsafe equipment [5]. A lack of effective safety management worsens these issues, causing accidents, disruptions, and slowdowns. This makes implementing ergonomic safety measures a significant challenge on construction sites [6].

Ergonomics is a science drawing on anatomy, physiology, psychology, engineering [7], and statistics to design workplaces, products, and systems that align with human capabilities, minimizing strain and risk. Instead of forcing people to adapt to uncomfortable or unsafe designs, ergonomics aims to tailor environments to meet users' needs [8]. In Malaysia, musculoskeletal disorders (MSDs) are the second most reported occupational issue [9], heavily affecting construction workers due to the physical demands of tasks like plastering, screeding, pipe laying, painting, and roofing [10]. These tasks often lead to injuries in muscles, ligaments, tendons, and joints due to poor posture and inadequate equipment.

Key ergonomic risks in construction include force, repetition, and posture, alongside vibration, contact stress, and prolonged exertion. Studies report high rates of MSDs among construction workers, with common pain areas being the lower back, shoulders, knees, and neck. For instance, [11] found a 79.6% prevalence of MSD symptoms, with similar findings in other

studies, identifying shoulders and lower back as frequent problem areas [12].

Addressing these ergonomic risks involves adapting the workplace to support neutral body positions and reduce strain through ergonomic design, training, administrative controls, and communication [13]. By identifying and addressing these risks, companies can create safer work environments, enhance productivity, and improve safety and health for construction workers. This study's findings aim to support improvements in safety protocols and workplace regulations to better protect construction workers.

II. Methodology

The research used a quantitative approach with a questionnaire survey on four residential projects in Klang Valley, focusing on trades like bricklaying, concreting, roofing, painting, and plastering. A total of 196 questionnaires were distributed to workers from Bangladesh and Indonesia, who were selected by the Safety and Health Officer (SHO) for their basic ergonomic knowledge. Due to language challenges, the SHO assisted by reading and explaining the questions to respondents. Data collected were then analysed descriptively using SPSS software to understand ergonomic risks and practices on-site.

III. Results and Discussion

Of the 196 sets of questionnaires distributed, 70 copies were returned with a 36% response rate which can be considered appropriate. According to [14], the exact meaning of a 'good' response rate varies but in general, an appropriate survey response rate ranges from 5% to 30%. Thus, anything more than 30% is considered significant.

A. Demographic

Demographic characteristics are vital components in this study. Demographic information including age, gender and type of work is presented in Table 1 as it shows the summary of demographic information of the respondents.

Table 1: Summary of Demographic Data of Respondents

Characteristics	Frequency	Percentage (%)
	Job Description	
Unskilled Labour	12	17.10
Skilled Labour	58	82.90
	Work Experience	
3-8	20	28.57
9-14	36	51.43
15-20	14	20.00
	Daily Works	
Masonry/Bricklayer	16	22.85
Concreting	8	11.43
Roofing	8	11.43
Painting/Plastering	8	11.43
General Workers	6	8.57
Electrician	8	11.43
Barbender	8	11.43
Plumber	8	11.43

Job Description

Table 1 shows that most respondents (82.9%) are skilled laborers, while 17.1% are unskilled. Skilled labor is essential in construction for quality and productivity, as skilled workers play a key role in project success. According to [15], skilled workers drive the construction industry and directly impact project outcomes. Skilled laborers are trained individuals who have completed apprenticeships, actively apply their trade, and are assigned complex tasks requiring significant expertise across specialized areas [16].

Years of Work in Construction Industry

The study established majority [36 (51.4%)] of the respondents had work experience between 9 and 14 years, followed by 3-8 years [20 (28.57%)] and only [14 (20%)] working 15-20 years. Respondents with 3-8 years show less than 9-14 years as [17] stated that young people are actively involved in the process of earning and job mobility, where most of them were paid

low which causes them to move into better paid employment.

Workers with working experience 15-20 years is less than 9-14 years because those workers retire early due to the nature of construction work and due to injuries or disabilities arising from the work [18].

Daily Works in Construction Site

According to Table 1, most respondents work in masonry or as bricklayers [16 (22.85%)], while 8 (11.43%) are involved in trades such as concreting, roofing, painting, plastering, electrical work, bar bending, and plumbing. General workers make up the smallest group [6 (8.57%)]. [10] explained that trades such as bricklaying, plastering, painting, concreting, carpentry, roofing, and masonry are exposed to ergonomic risks, which can lead to musculoskeletal disorders (MSDs). Similarly, [19] noted that various trades, including rebar workers, formwork workers, concrete workers, and component decorators, are involved in the construction process. These workers often perform demanding manual tasks and face ergonomic risks.

Following that, Table 2 highlights the trades that have strenuous tasks in their daily work. The most strenuous activity, ranked first, is rotation, with a mean score of 4.47 (SD = 0.557). Heavy lifting ranks second, with a mean score of 3.90 (SD = 0.827), followed by sliding, which ranks third with a mean score of 3.11 (SD = 1.325). According to [10], for example, bricklayers often engage in daily tasks that involve both rotation and heavy lifting. This indicates that even within a single trade, workers may face various types of strenuous activities that contribute to ergonomic risks.

Table 2: Daily Works Strenuous

Daily Works Strenuous	Mean	Standard deviation	Rank
Rotation	4.47	0.557	1
Heavy Lifting	3.80	0.827	2
Sliding	3.11	1.325	3

As for the working hours, based on Table 3, it clearly shows that the working hours of the trades are 8 hours with all (100%) of the respondents agreed. According to [20], workers must work for 8 hours every day according to Labor Act of 2007. This is similar with Law of Malaysia Act 265 Employment Act 1955 [21].

Table 3: Working Hours in a Day

Working hours in a day	Frequency	Percentage
8 hours	70	100
4 hours	0	0
6 hours	0	0
12 hours	0	0
More than 12 hours	0	0

Table 4: Breaks During Working Hours

Breaks during working hours	Frequency	Percentage
1 hour	70	100
2 hours	0	0
3 hours	0	0
4 hours	0	0
5 hours	0	0

Other than that, Table 4 shows the duration of breaks during working hours. The results showed that all (100%) of the respondents agreed that their break time is one (1) hour. According to Ndiwa [18], most workers take breaks, but further investigation revealed that these breaks are only allowed by supervisors or developers during lunch hours, after which work resumes. Additionally, the Labor Act of 2007 mandates that workers must work for 8 hours each day. Working long hours without adequate breaks can lead to fatigue, which poses safety and health risks. Fatigue impairs workers' ability to perform their duties effectively, affecting their judgment, productivity, efficiency, and the quality of their work [20].

Furthermore, fatigue can lead to serious accidents, resulting in injuries and even fatalities among workers.

B. Ergonomic Risk

Ergonomic risks are factors in the workplace that can lead to musculoskeletal disorders (MSDs) or other injuries due to poor ergonomic practices.

Understanding of Ergonomic Risk

Table 5 shows that 100% of the trades understand what ergonomic risk is. Results indicate that those trades were aware of what ergonomic risk is since the toolbox briefing was held every morning before they started work at construction sites.

Table 5: Understanding of Ergonomic Risk

Do you understand what ergonomic risk is?	Frequency	Percentage
Yes	70	100
No	0	0

As explained by [22] construction workers' safety depends on their ability to detect and assess risks. Safety training enhances workers' awareness of common risks on construction sites and improves their risk awareness knowledge.

Exposure of Ergonomic Risk

According to Table 6, the most common ergonomic risk exposed by trades is repetitive or awkward movements, ranked first with a mean score of 4.70 (SD = 0.462). This is followed by high task repetition, ranked second, with a mean score of 3.77 (SD = 1.364). Ranked third is exposure to extreme temperatures, with a mean score of 3.76 (SD = 1.449). The fourth-ranked risk is contact stress, with a mean score of 3.54 (SD = 0.755). Forceful exertion and vibration are ranked fifth and sixth, with mean scores of 3.37 (SD = 1.206) and 1.89 (SD = 1.314), respectively.

Babu and Xavier [23] concur that force and repetition are major ergonomic risk factors, as identified using the RII (Relative Importance Index) method for

ranking these factors. Similarly, the Michigan Occupational Safety and Health Administration [12] identifies force, repetition, and posture as major ergonomic risk factors, along with vibration, contact stress, sustained exertions, and exposure to cold temperatures. Traditionally, workers in the construction industry suffer from musculoskeletal disorders (MSDs) due to these ergonomic risks, although these issues often go unnoticed by the workers themselves.

Table 6: Exposure of Ergonomic Risk

Ergonomic Risk	Mean	Standard deviation	Rank
Repetition/Awkward	4.70	0.462	1
High Task Repetition	3.77	1.364	2
Extreme Temperature	3.76	1.449	3
Contract Stress	3.54	0.755	4
Forceful Exertation	3.37	1.206	5
Vibration	1.89	1.314	6

VI. Conclusion

The study shows that trades are exposed to various ergonomic risks, with repetitive or awkward movements being the most common, followed by high task repetition and extreme temperatures. These risks often lead to musculoskeletal disorders (MSDs), with lower back pain being the most prevalent issue, corroborated by previous research.

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VIII. References

[1] K. In Ju, “The role of ergonomic in construction industry safety and health improvement,” *J. Ergonomics*, vol. 7, no. e166, pp. 1-4, 2017.

[2] N. H. Abas, N. Yusuf, N. A. Suhaini, N. Kariya, H. Mohammad, and M. F. Hasmori, “Factors affecting safety performance of construction projects: A literature review,” *IOP Conf. Ser.: Mater. Sci. Eng.*, vol. 713, no. 012036, pp. 1-9, 2020.

[3] Q. Meng, W. Liu, Z. Li, and X. Hu, “Influencing factors, mechanism

and prevention of construction workers' unsafe behaviours: A systematic literature review," *Int. J. Environ. Res. Public Health*, vol. 18, no. 5, pp. 2644, 2021.

[4] H. Y. Chong and T. S. Low, "Accidents in Malaysian construction industry: Statistical data and court cases," *Int. J. Occup. Saf. Ergon.*, vol. 20, no. 3, pp. 503-513, 2014.

[5] D. O. Asibey, J. Ayarkwa, A. Acheampong, E. Adinyira, and P. Amoah, "An examination of causes of accidents and hazards in the Ghanaian construction industry," *Open J. Saf. Sci. Technol.*, vol. 11, no. 2, pp. 66-88, 2021.

[6] N. H. Adnan and A. Ressang, "Ergonomic awareness on construction site," *Faculty of Engineering, Universiti Teknologi Malaysia*, pp. 190-202, 2014.

[7] P. Waterson, "World War II and other historical influences on the formation of the ergonomics," *Research Society Ergonomics*, vol. 54, no. 12, pp. 1111-1129, 2011.

[8] Chartered Institute of Ergonomic & Human Factors, "What is ergonomics?" [Online]. Available: https://www.ergonomics.org.uk/Public/Resources/What_is_Ergonomics_.aspx

[9] Department of Occupational Safety and Health (DOSH), "Occupational diseases statistic," n.d. [Online]. Available: https://www.dosh.gov.my/index.php/statistic-/occupational-diseases-statistic

[10] N. S. Lop, I. F. M. Kamar, M. N. A. Aziz, L. Abdullah, and N. M. Akhir, "Work-related musculoskeletal disorder amongst Malaysian construction trade workers: Bricklayer," *AIP Conf. Proc.*, pp. 1-6, 2017.

[11] M. C. Foong, M. Y. Adon, B. Rafee, and A. A. Azuhairi, "Prevalence of musculoskeletal symptoms among production line workers in a printing manufacturing company in Malaysia," *Int. J. Public Health Clin. Sci.*, vol. 1, no. 1, pp. 109-117, 2014.

[12] M. A. J. Jabbar, C. Jayesh, K. T. Hong, and M. Retneswari, "Prevalence of work-related musculoskeletal disorders among cashiers in Selangor, Malaysia: A cross-sectional study," *Malaysian J. Public Health Med.*, vol. 23, no. 2, pp. 300-311, 2023.

[13] A. H. A. Tharim, N. Jaffar, N. S. Lop, and I. F. M. Kamar, "Ergonomic risk controls in construction industry: A literature review," *Procedia Eng.*, vol. 20, pp. 80-89, 2011.

[14] Kantar, "The magic number: How to optimize and improve your response rate," 2023. [Online]. Available: https://www.kantar.com/inspiration/research-services/what-is-a-good-survey-response-rate

[15] S. Ahmed, M. I. Houqe, and M. H. R. Sobuz, "Analysis of skilled

worker criteria of construction industry," *J. Syst. Manag. Sci.*, vol. 7, no. 2, pp. 53-78, 2017.

[16] M. A. M. Fateh, M. R. Mohamed, and S. A. Omar, "The involvement of local skilled labour in Malaysia's construction industry," *Front. Built Environ.*, vol. 8, pp. 1-13, 2022.

[17] K. Ginige, D. Amaratunga, and R. P. Haigh, "Gender stereotypes: A barrier for career development of women in construction," *Built Environ. Edu. Conf.*, pp. 1-10, 2007. [Online]. Available: https://www.researchgate.net/publication/46419175

[18] S. C. Ndiwa, "Ergonomic risk factors among workers in building construction sites in Mombasa County," M.S. thesis, Jomo Kenyatta Univ. Agric. Technol., 2019.

[19] Y. Tao, H. Hu, Z. Zhang, and J. Xu, "Evaluation of ergonomic risks for construction workers based on multicriteria decision framework with spherical fuzzy set and alternative queuing method," *Sustainability*, vol. 16, no. 10, pp. 1-20, 2024.

[20] R. Wilkins, "Do long working hours lead to more workplace injuries? Evidence from Australian industry level panel data," *Melbourne Institute Working Paper*, no. 07/04, pp. 1-20, 2004.

[21] Laws of Malaysia, "Act 265 Employment Act 1955," 2023. [Online]. Available: https://jtksm.mohr.gov.my/sites/default/files/202311/Akta%20Kerja%201955%20%28Akta%20265%29.pdf

[22] A. Ojha, J. Seagers, S. Shayetesh, M. Habibnezhad, and H. Jebellis, "Construction safety training methods and their evaluation approaches: A systematic literature review," in *Proc. 8th Int. Conf. Construction Eng. Project Manag.*, Hong Kong SAR, Dec. 7-8, pp. 188-197, 2020.

[23] T. Babu and A. S. Xavier, "Ergonomic analysis of building construction workers using RII," *Int. Res. J. Eng. Technol.*, vol. 05, pp. 601-605, 2018.