

ARTICLE TYPE (RESEARCH ARTICLE)

Knowledge and Awareness of Ergonomic Posture and Occupational Musculoskeletal Disorders (MSDs) among Office Workers in Klang Valley

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Abstract:

This study examined the association between ergonomics knowledge and awareness and the prevalence of MSDs among office workers in Klang Valley, Malaysia. Three hundred thirty-five participants aged 21-50 completed an online survey. The participants' level of knowledge and awareness of ergonomics posture were analyzed using adopted Knowledge and Awareness of Ergonomics posture questionnaires (NMQ). NMQ questionnaire was used to determine the prevalence of occupational MSDs across body regions in the past 12 months among participants. Results revealed that while office workers had a moderate level of knowledge about ergonomics, their awareness was high. Despite this, 36.4% reported experiencing MSDs in at least one body region, primarily in the shoulders, wrists, neck, upper back, and lower back. A significant positive correlation was found between the level of knowledge and awareness of ergonomics posture and the prevalence of MSDs. This suggests that increasing ergonomic education and awareness can help reduce the occurrence of these disorders among office workers. The findings of this study provide valuable insights for future research and policy development aimed at promoting healthier work habits and practices in office environments.

Keywords: Ergonomics, ergonomics knowledge, ergonomics awareness, occupational MSDs, office workers

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1. INTRODUCTION

Ergonomics studies of human biomechanics focus on posture and comfort in handling tasks (Salvendy et al., 2012). Specifically, applying ergonomic principles is believed to minimize the computer users' ergonomic hazards as it enables 'fitting the task to the worker', which means assessing the fit between the environment and the worker (Khan et al., 2012; Baker & Redfern, 2009). A study by Mani et al. (2018) stated that office workers are prone to develop occupational MSDs. In a report from Mohammadipour et al. (2018), 50% of office workers with frequent computer use (3-5 hours) demonstrated a high prevalence of occupational MSDs in recent years. Commonly reported physical risk factors of occupational MSDs include prolonged sustained standing and sitting posture which puts physical strain on the upper and lower back, the awkward posture of the head, neck, and trunk, and repetitive motion of fingers and wrist (Khan et al., 2015; Loghmani et al., 2013; Sonne et al., 2012). Also, poor workplace ergonomics such as chairs increase the risk of developing pain and discomfort especially in the lower back (Chaiklieng & Krusun, 2015; Matos & Arezes, 2015;

Poochada & Chaiklieng, 2015). MSDs can lead to disability, reduced work performance, and end of career due to the participation restriction in work in the long run (Janga & Akinfenwa, 2012).

Occupational MSDs are usually characterized by discomfort, pain, stiffness, swelling, redness, weakness, tingling, or numbness. It usually affects most body regions, such as the upper back, lower back, neck, shoulder, hand, knees, hips, and ankle (Estember & Huang, 2019). While most studies assess muscular and mental strain, few studies acknowledged eye problems associated with working hazards, which can also occur due to prolonged exposure to the monitor for hours. Eye problems may include eye strain, blurriness, dryness, headache, and difficulty focusing while using a monitor (Robertson et al., 2013; Amick et al., 2012).

Several studies have shown the causal-effect relationship between working postures and the prevalence of MSDs. A cross-sectional study shows that working postures have direct effects on occupational MSDs complaints among office workers (Che Mansor et al. 2013), while Rodrigues et

al. (2017) showed that office workers with MSDs complaints have worse ergonomics posture compared to office workers without MSDs complaints. So far, in Malaysia, studies by Jaafar et al. (2019) and (2021) have assessed knowledge and awareness of ergonomics, however, no association was done with the prevalence of occupational MSDs.

However, studies to assess workplace ergonomics, ergonomic training, and MSDs prevalence are scarce. In addition, the identification of causal for the risk factors of MSDs (i.e., knowledge and awareness of ergonomics) along with the prevalence of MSDs among office workers in Malaysia could determine primary and specific ergonomics training to be incorporated based on the root causes.

This study aims to determine the knowledge and awareness of ergonomics posture and the prevalence of occupational MSDs among office workers in Klang Valley. Also, the study aimed to determine the relationship between sociodemographic characteristics with knowledge and awareness of ergonomics as well as occupational MSDs.

2. METHODS AND MATERIALS

This was an online cross-sectional study of office workers in Klang Valley using a self-administered questionnaire. The participant’s information sheet was also attached to the questionnaire to explain the purpose of the study. The number of samples was determined by using Krejcie & Morgan’s (1970) table. With an estimation of 100,000 office workers in Klang Valley, the representatives’ samples were 384 respondents. The data was collected by distributing the questionnaire in the form of Google Forms to the respondents who were randomly selected through emails, Instagram, Telegram, and WhatsApp contacts. A poster to call for respondents, with study information, a link, and a QR code to the questionnaire was created. The poster was then distributed through social media platforms such as Instagram, Telegram, and WhatsApp contacts. The poster was also distributed offline where eligible participants scanned the QR code in the poster using their device and completed the online questionnaire. The questionnaire was also distributed through the emails of businesses and offices around Klang Valley. The duration of the data collection was three months. Research ethics approval has been obtained from UiTM’s Research Ethics Committee (Ref: FERC/FSK/MR/2021/0192, dated 12 September 2022).

The inclusion criteria of the respondents for this study were office workers aged 21-50 years old, working on a computer for a minimum of 20 hours/week, and at least one year of working experience. Participants who were pregnant had a second job, and experienced injuries not caused by occupation were excluded. The knowledge and awareness of ergonomics questionnaire from a previous study among office workers was chosen as a research instrument (Jaafar et al., 2019). The questionnaire is divided into 3 sections, which are sociodemographic data (Section 1), Nordic Musculoskeletal Questionnaire (NMQ) (Section 2), and

Knowledge and Awareness of Ergonomic Questionnaire (Section 3).

Data were analysed by using the Statistical Package for the Social Sciences (SPSS) version 26.0 and statistically described. Descriptive statistics - frequencies, mean and standard deviation (SD) were calculated for data in the study (demographic data, knowledge, awareness, prevalence of MSDs). The relationship between knowledge and awareness of ergonomics posture and the prevalence of occupational MSDs was analysed by using Pearson Chi-square. A p-value less than 0.05 ($p \leq 0.05$) indicates statistical significance.

3. RESULTS

Demographic characteristics

A total of 335 respondents have completed the study. A total of 165 respondents were male with 50.7% of the participants being female. More than half (60%) of respondents were aged 41 years and above (Table 1). The Body Mass Index (BMI) of the respondents was 23.6% underweight, 30.4% normal weight, 25.7% overweight, and 20.3 % obese.

For education, 115 (34.3%) of participants had a Bachelor’s Degree followed by pre-university (22.7%), post-graduate (22.4%), and secondary school (20.6%).

Table 1: The demographic characteristics of the participants.

Demographic characteristics	N	%
Gender		
Female	170	50.7
Male	165	49.3
Age (in years)		
21 to 30	86	3.0
31 to 40	47	9.7
41 to 50	202	22.6
BMI (kg/m²)		
Below 18.5	79	3.8
18.5 to 24.9	102	36.3
25 to 29.9	86	42.5
30 or greater	68	17.5
Educational Level		
Secondary school	69	20.6
Pre-University	76	22.7
Undergraduate	115	34.3
Post Graduate	75	22.4
Working Hours		
4 to 6 hours	89	26.6
7 to 9 hours	134	40.0
>9 hours	112	33.4
Working Experience		
1 to 5 years	147	43.9
6 to 10 years	72	21.5
11 to 15 years	51	15.2
≥ 16 years	65	19.4

The Prevalence of Occupational MSDs

A total of 122 (36.4%) respondents declared they have had the symptoms of occupational MSDs in at least one mentioned body region in the past 12 months (Table 2).

Table 2: Prevalence of Occupational MSDs.

Occupational MSDs	N	%
Yes	122	36.4
No	213	63.6
Total	335	100

Table 3 indicates the prevalence of occupational MSDs during the last 12 months in different parts of the body among the 335 respondents. The total prevalence of occupational MSDs across body parts mainly involves shoulders (24.5%) with an almost equal proportion of prevalence of MSDs at the wrist, neck, upper back, and lower back (22%). Ankle/Feet (18.5%) was the least body region affected.

Table 3: Prevalence of Occupational MSDs in different body parts.

Body Parts	N	(%)
Neck	75	22.4
Shoulders	82	24.5
Upper back	74	22.1
Elbow	63	18.8
Wrist/Hands	76	22.7
Low back	73	21.8
Hips/Thighs	72	21.5
Knees	65	19.4
Ankle/Feet	62	18.5

The level of knowledge about ergonomics posture

Figure 1 shows the distribution of the responses based on their ergonomics knowledge. Close to half (48.4%) of the respondents have seen and heard the word ergonomics in various media (M = 3.19, SD = 1.44), and comparably, more than 48% who have read an issue related to ergonomics (M = 3.24, SD = 1.15). More than 44% of respondents have attended ergonomics discussions (M = 3.19; SD = 0.83) while 46% of participants know and understand ergonomics (M = 3.23; SD = 0.95) which means 2% acquired ergonomics understanding from reading and listening from media. Not more than 25% of respondents have seen the word ergonomics on the notice board in their office (M = 2.74, SD = 1.14).

Figure 2: Means score of respondents' level of ergonomics posture.

The number of neutral answers is slightly higher with an average of 27.4%. More than half (63.9%) of the participants have an average level of knowledge about ergonomic posture

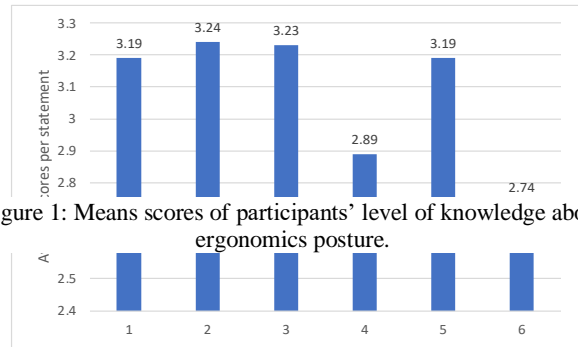


Figure 1: Means scores of participants' level of knowledge about ergonomics posture.

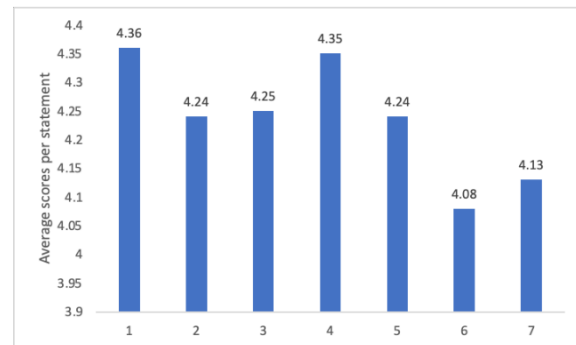
with an overall mean knowledge score of 3.08 (SD = 1.08) (Table 4).

Table 4: Level of Knowledge about Ergonomics Posture

Level	N	(%)
Poor (6-12)	41	12.2
Average (13-23)	214	63.9
High (≥24)	80	23.9
Mean = 3.08; SD = 1.08		

The level of awareness about ergonomic postures

The awareness of ergonomics posture among the participants was rated based on items as shown in Figure 2. The result showed that the working population in Klang Valley has a high level of awareness of ergonomic posture with an overall mean awareness score of 4.24 (SD = 0.79). Most participants agreed inappropriate way of lifting can result in back pain (M = 4.36; SD = 0.72). Comparably, participants were aware of fatigue caused by discomfort in body position between the chairs and desks and incorrect position between eyes and computers (M = 4.25; SD = 0.73) and (M = 4.35; SD = 0.71). Most participants agreed that fatigue caused by lighting in the workplace is either too low or insufficient, like uncomfortable chairs and tables, noisy and poor air conditioning systems can reduce productivity and quality of their work.



The relationship between gender, educational level, and work experience with knowledge of ergonomic posture

Table 5 presents cross-tabulation results between sociodemographic characteristics and the respondents' level of ergonomics posture knowledge. Data suggest that females ($\chi^2 = 8.810$; $p = 0.012$) and/or higher education levels ($\chi^2 = 19.209$; $p = 0.004$) were significantly related to the higher level of knowledge. Thus demographic characteristics can determine their level of knowledge about ergonomic posture. However, no significant relationship was found between respondents' working hours and level of knowledge about ergonomic posture.

Table 5: The relationship between gender, educational level, and work experience with knowledge of ergonomic posture.

Variables	Level of Knowledge of Ergonomics Posture		
	High N (%)	Average N (%)	Poor N (%)
Gender			
Male	50 (62.5)	93 (43.5)	22 (53.7)
Female	30 (37.5)	121 (56.5)	19 (46.3)
χ^2 (df) = 8.810 (2); p-value = 0.012			
Educational Level			
High school	21 (26.3)	34 (15.9)	14 (34.1)
Pre-University	16 (20.0)	46 (21.5)	14 (34.1)
Undergraduate	22 (27.5)	82 (38.3)	11 (26.8)
Graduate	21 (26.3)	52 (24.3)	2 (4.9)
χ^2 (df) = 19.209 (6); p-value = 0.004			
Work Experience			
1 – 5 years	34 (42.5)	97 (45.3)	16 (39.0)
6 – 10 years	19 (23.8)	44 (20.6)	9 (22.0)
11 – 15 years	16 (20.0)	31 (14.5)	4 (9.8)
≥ 16 years	11 (13.8)	42 (19.6)	12 (29.3)
χ^2 (df) = 6.097 (6); p-value = 0.412			

The relationship between gender, educational level, and work experience with the level of awareness of ergonomics posture

Table 6 summarizes the result of the cross-tabulation analysis among sociodemographic characteristics and participants' awareness of ergonomics posture. None of the respondents possessed a poor level of awareness about ergonomic posture regardless of their gender, educational status, and working experience. Nonetheless, the Pearson Chi-Square test revealed no significant relationship between the variables and the level of awareness about ergonomic posture.

Table 6: The relationship between gender, educational level, and work experience with awareness of ergonomic posture.

Variables	Level of Awareness of Ergonomics Posture
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	High N (%)	Average N (%)	Poor N (%)
Gender			
Male	132 (51.8)	33 (41.3)	0
Female	123 (48.2)	47 (58.8)	0
χ^2 (df) = 2.694 (1); p-value = 0.101			
Educational Level			
High school	52 (20.4)	17 (21.3)	0
Pre-University	55 (21.6)	21 (26.3)	0
Undergraduate	93 (36.5)	22 (27.5)	0
Graduate	55 (21.6)	20 (25.0)	0
χ^2 (df) = 2.358 (3); p-value = 0.502			
Work Experience			
1 – 5 years	115 (45.1)	32 (40.0)	0
6 – 10 years	55 (21.6)	17 (21.3)	0
11 – 15 years	41 (16.1)	10 (12.5)	0
≥ 16 years	44 (17.3)	21 (26.3)	0
χ^2 (df) = 3.415 (3); p-value = 0.332			

The relationship between gender, BMI, level of knowledge, and awareness of ergonomics posture with the prevalence of MSDs

Table 7 shows that the prevalence of occupational MSDs was high among male participants compared to female respondents ($p < 0.05$). Similarly, there was a significant difference in the prevalence of occupational MSDs among BMI groups of the participants.

There was a significant relationship between the level of knowledge and awareness about ergonomics posture and the prevalence of MSD in at least one body part ($p < 0.05$)

Table 7: The relationship between gender, BMI, level of knowledge, and awareness of ergonomics posture with the prevalence of MSDs.

Variables	Prevalence of Occupational MSDs		χ^2 (df)	p-value
	Present N (%)	Not Present N (%)		
Gender				
Male	71 (58.2)	94 (44.1)	6.140 (1)	0.013
Female	51 (41.8)	119 (55.9)		
BMI				
Underweight	37 (30.3)	42 (19.7)	26.249 (3)	0.000
Normal	21 (17.2)	81 (38.0)		
Overweight	45 (36.9)	41 (19.2)		
Obese	19 (15.6)	49 (23.0)		
Knowledge				
Poor	21 (10.7)	20 (14.4)	9.757 (2)	0.008
Average	82 (67.2)	132 (62.0)		
High	19 (15.6)	61 (28.6)		

Awareness				
Poor			12.234	0.000
Average	16 (13.1)	64 (30.0)	(1)	
High	106 (86.9)	149 (70.0)		

4. DISCUSSION

Ergonomics ensures all types of equipment and tasks that could impose work hazards such as workstation settings and design, and workers' posture fit each person to reduce physiological stress (Jaafar et al., 2021). An office worker usually works at a computer for an idle long time which requires prolonged static sitting, repetitive motions of hands and wrist, and prolonged glare on screen (Bisht & Bakhshi, 2018). A recent study by Emerson et al. (2021) added that old, malfunctioning, non-adjustable, and ill-fitting equipment could also take a toll on a worker's well-being and health.

The study found that ergonomic posture knowledge among most office workers is average, while awareness is high among those in Klang Valley. This is consistent with previous literature, such as those by Jaafar et al. (2019) and Jaafar et al. (2021). The average level of knowledge may be attributed to factors such as limited employer involvement in promoting ergonomic practices as less than one-third of office workers claimed to see the ergonomics word on posters/notice boards at their workplace. Most office workers claimed to know and understand ergonomics through attending ergonomics discussions, reading, and listening to media. This indicates when employees were allowed to participate in discussions or workshops on ergonomics, they were able to enhance their knowledge levels. Participatory ergonomic interventions, such as in the study of Capadoglio (2022), increased knowledge and awareness of workers' safety, thus reducing the risk of occupational MSDs.

There was also a significant difference in knowledge between demographic variables, with the female gender having better knowledge regarding ergonomics. This result agreed with a study by Kritika et al. (2014) which stated that females are higher at risk of developing MSDs thus they are more cautious than males. Also, higher education levels are positively associated with higher knowledge of ergonomics. However, Sirat et al. (2018) strongly stated education level did not have to do with ergonomics awareness as it was just the level of formal education such as mathematics, science, physics, and other formal subjects. Therefore, the conclusion can be drawn here is a large proportion of participants are from the Undergraduate and Postgraduate level, therefore a significant value was obtained from the data. A study with a larger difference in education level would help determine the reliability of the association found in this study.

Furthermore, there was no positive association between sociodemographic data (gender, education level, working

experience) and ergonomics awareness which is consistent with Sirat et al. (2018).

This study found that over one-third of office workers reported occupational musculoskeletal disorders (MSDs) in at least one body region over the last 12 months. This highlights the prevalence of MSDs among the study group, suggesting a link between the prevalence of MSDs and the high level of awareness exhibited by office workers. Despite the high level of awareness about ergonomic posture principles, a considerable number of office workers still experience musculoskeletal issues. This highlights the importance of effective implementation of ergonomic practices to reduce occupational MSDs among office workers.

The most common body parts found to be affected in occupational MSDs were the shoulders, wrist, neck, upper back, and lower back. Previous literature on the topic suggests that these areas are commonly susceptible to MSDs in office work settings (Russo et al., 2020; Singh et al., 2018). Studies have found that the highest prevalence of MSDs occurs in the lower back, ankle/feet, neck, and shoulders, followed by the lower limb among Italian workers (Russo et al., 2020). Noorozi et al. (2014) also found the highest frequency of occupational MSDs in the back and neck regions. Low back pain ranks as the most frequent condition in years lived with disability caused by occupational MSDs (Hoy et al., 2014).

The study explored the association of the prevalence of occupational MSDs in at least one body part among office workers in Klang Valley with sociodemographic characteristics. The major risks for MSDs were female gender and BMI. Occupational MSDs are higher reported among women, especially in European countries (Farioli et al., 2014). BMI increases the risk of occupational MSDs, with obese and overweight workers being more susceptible to developing them compared to normal-weight workers. The study data also corresponds with Krishnan et al.'s (2021) study on the prevalence and risk factors of MSDs across body parts among nurses which concluded that the frequency of having MSDs at any part of the body increases with age, female gender, high BMI, and job tenure. Furthermore, Shariat et al. (2018) also found a significant association between the prevalence of occupational MSDs across body parts with age, gender, and BMI in a study among Malaysian office workers in Klang Valley.

The study found that higher ergonomic posture knowledge and awareness significantly reduce the prevalence of occupational musculoskeletal disorders (MSDs) in at least one body part. This is consistent with previous studies demonstrating the importance of empowering employees with the right knowledge to promote ergonomic practices and enhance preventive behaviour (Aulianingrum & Hendra, 2022; Damanhuri et al., 2014; Sohrabi & Babamiri, 2021). Studies have shown that implementing ergonomic interventions is effective in reducing MSD prevalence,

especially in the neck and upper limbs. Additionally, a systematic review by Aulianingrum & Hendra (2022) found that workers with poor knowledge of ergonomics have a higher risk of developing MSDs. This finding is consistent with Damanhuri et al. (2014) findings at Putra University Malaysia (UPM), which found a significant relationship between knowledge of ergonomics posture and complaints of MSDs. Almost half of workers with MSDs complaints have a poor knowledge of ergonomics posture while the majority of workers with MSDs complaints did not go for ergonomics training at the workplace. Employers can create a healthier and more productive work environment that minimizes the risk of MSDs and related health issues by providing the employees with the right knowledge and promoting ergonomic practices.

There are several limitations in this study. First, this study population was specifically office workers from Klang Valley. Moreover, this study was done fully online, so researchers cannot determine external bias. Furthermore, the data collection of MSDs symptoms relied on self-reported data from the respondents. Other than that, this study did not delve deeper into specific risk factors to address MSDs prevalence such as working conditions, work-related activities, and disability arising from MSDs symptoms among office workers. Addressing these risk factors could help employers to address the root causes of absenteeism and pain among office workers.

5. CONCLUSION

The survey results showed that only an average level of knowledge about ergonomics posture was possessed by the office workers. One of the factors that contributed to the average level of knowledge was said to be lack of employers' role to promote ergonomics posture in the workplace. Females showed a higher knowledge level of ergonomics posture while a higher education level was associated with a higher level of ergonomic posture. On the other hand, the level of awareness about ergonomics posture was found to be high despite the average level of knowledge which means office workers are concerned with the effect of not practicing ergonomics despite lack of knowledge about the ergonomics posture. Meanwhile, the office workers reported a prevalence of MSDs with primarily reported pain in the shoulders, wrist, neck, upper back, and lower back. Additionally, the result from this study demonstrated a significant positive association between knowledge and awareness of ergonomic posture and the prevalence of MSDs among office workers. Hence, the employers and the policymakers should play their respective roles to leverage office workers' knowledge maximally and efficiently as well as provide safe and healthier workstations and designs for the workers. For instance, employers can begin by including ergonomics training and education program which have been proven effective in increasing workers' ergonomic knowledge and awareness besides reducing the risk of MSDs.

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