Original Article

The Risks of Work-Related Musculoskeletal Disorders among Business Service Center Workers

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ABSTRACT: *Work-related musculoskeletal disorders (WMSD) has become one of the occupational health issues in this industrial world including Malaysia. Epidemiological studies have shown that musculoskeletal disorders are widely prevalent among employees who work with computers. The purpose of this study was to identify whether the duration of visual displaying unit (VDU) usage could contribute to the risk-level of work-related musculoskeletal discomforts (WMSD) in various body regions. A cross-sectional study comprised 300 workers was conducted among employees in a business service centre who are using VDU for their daily routine tasks. The results showed a high prevalence rate of WMSD and there was also statistically significant difference between the hours of VDU usage and the risk-level of WMSD towards their body reigns. This study also concluded that the risk-level of WMSD increases according to the length of VDU usageduration.*

Keywords: *Ergonomic, Occupational Health, Occupational Safety & Health, VDU, Work-related Musculoskeletal Disorder,*

1.0 INTRODUCTION

Work-related musculoskeletal disorders (WMSD) represents the most common occupational health disease in this industrial world (Hossain et al., 2018; Franco, 2010). WMSD has also been found as the main occupational health issue in Japan as well as Korea (Kim & Nakata, 2014). Similarly, WMSD is also becoming one of the main occupational health problems in Malaysia as it is reported to be the second highest occupational diseases in the country (SOCSO, 2009-2016). Furthermore, 153 out of 603 recorded occupational diseases are categorized as ergonomics related cases and were financially compensated by SOCSO in 2014 (SOCSO, 2015). Moreover, WMSD cases increase in a double figure from 2008 to 2009 as per reported in SOCSO Annual Report (SOCSO, 2010). These statistics proves that ergonomic hazards in workplaces must be seriously addressed and prompt actions should be taken by relevant parties in preventing WMSD from continually increasing in Malaysia.

WMSD among workers brings serious impact to an organization. Gallagher and Heberger (2012) revealed that WMSD is a major cause of lost workdays (average four days) in industries. Moreover, WMSD also is accounted for the highest rate of disability among workers as well as economic cost associated with considerable amount of disability, sick leave, compensation days, and loss of productivity (Yassi, 2000; Straaton, 1998; Cole 1996). Ergonomic factors are found to be the main factor towards WMSD. Ergonomics factors are such as work station design, repetitive movement, awkward position, prolong standing and sitting, manual handling as well as vibrations. A work by Buckle (2005) concluded that work station design, lighting, and video display unit (VDU) are factors which could contribute to WMSD. Meanwhile, other researchers stated that factors which could lead to WMSD are ‘work factors’ namely workload, job demands, hours worked with computer, consistent awkward postures, psychological and psychosocial stress (Bernard et al. 1994; Bongers

et al. 1993; Carayon & Smith 2000). Computers or also renowned as visual displaying unit (VDU) is one of the factors which could contribute to WMSD among involved workers. This fact has been determined by several researchers such as Ardahan & Simsek (2016) who found that one of the factors towards WMSD is the ever-increasing usage of computers. In addition, Wu et al., (2012) has also determined that musculoskeletal disorders (MSD) usually occurs on the neck, shoulders, and upper limbs of the body when a worker uses computer for a long duration of time.

Ardahan and Simsek (2016) performed a study on 395 office workers and analyzed the prevalence of WMSD among computer-users. Base on the results acquired, 67.85% of participants reported musculoskeletal discomforts symptoms in the neck, 66.33% in back, 59.49% in lower back, and 45.32% at right shoulder. The research also distinguished that musculoskeletal discomfort risks was relatively high among the long daily computer-users. On the other hands, Noroozi et al. (2015) stated that office works are among the jobs that have high prevalence of musculoskeletal disorders. Prolonged sitting and working with computer are some of the causes for workers to experience musculoskeletal disorders. Moreover, Kalinienne et al. (2016) conducted a study among office workers using RULA checklist. The study indicated that the prevalence rates of shoulder, elbow, wrist hand, upper and low back pain were 50.5 %, 20.3 %, 26.3 %, 44.8 %, and 56.1 %, respectively. Computer work experience factor was found as significant towards musculoskeletal pain in various body regions, besides individual factors namely gender, age and body mass index.

The duration of VDU usage has also been found as a contributor towards WMSD. According to Mozafari et al. (2013), there was a relationship between work length with VDU as well as prolonged sitting position with the prevalence of WMSD. Gerr and Monteilh (2004), in their research, has reported an association between health outcomes and daily hours of computer use. The study revealed a significant impact imposed by the duration of VDU usage on eye discomfort as well as WMSD. These results were similar to Al-Wehedy et al., (1999) and Jensen (2004) who also determined that the duration of VDU usage among employees predict a high prevalence of musculoskeletal disorders as well as headache.

In BP Business Services Centre (BPBSC), employees spend most of their time at VDU terminal performing their daily routine tasks. With such working nature, they are highly exposed to ergonomic related hazards. Majority of workers in BPBSC are female. They work in sitting position for an average of 8 hours per day, using personal computer. A preliminary survey had been conducted among the clerical staff in 2015. Based on the interview, more than 300 employees admitted that they experience muscle pain and discomfort due to work.

Therefore, this study aims to determine the risk of WMSD among BPBSC staff based on the hours of working with VDU. In specific, the objectives of the study are as follows:

1. To determine the prevalence rate of WMSD among BPBSC staff
2. To distinguish WMSD risk level according to the duration length of VDU usage among the clerical staff in BPBSC.
3. To examine the effect of VDU usage duration towards WMSD risk level based on body reigns among the clerical staff in BPBSC.

In terms of the significant of study, this research is expected to contribute to the employer as the findings could become referral data in order to plan and implement further adjustment and improvement, especially in terms of workstation design in order to prevent WMSD. This study's results would become the only empirical evidence towards the employer regarding to the prevalence of WMSD among its clerical staff and should lead to further planning of preventive interventions. Besides, this study could serve as an additional reference for the relevant government agencies to establish related program on instilling knowledge about WMSD prevention among office workers. The results also could become part of reference in developing standard guidelines or industrial code of practice- ICOP related to ergonomic at workplaces.

Lastly, this study is expected to contribute to the body of knowledge in terms of the prevalence rate of WMSD among office workers, plus the impact of VDU towards WMSD risk. The findings could contribute in updating the literature on this area.

2.0 METHOD

This research is a quantitative design research and the data is collected using a self-administered questionnaire. The subject of this study comprised the visual display terminal users in BPBSC, Kuala Lumpur. A questionnaire consists two sections has been used as the research instrument. The first part of the questionnaire was designed to gather the personal demographic details of the respondents' age, gender, and daily computer using duration. The duration of computer usage daily was categorized into three which are 2-4 hours, 5-7 hours and 8 hours & above, adapted from Wu et al., (2012) with some modification to suite the working hours of BPBSC, Kuala Lumpur. Meanwhile, the second part of the questionnaire was designed to assess the musculoskeletal pain involving 12 body region: neck, shoulders, elbows, wrists/hands, forearm, mid back, lower back, hips, thighs, knee, lower legs, and foot. For the purpose of assessing the prevalence of WMSD according to body regions, the Nordic Musculoskeletal Questionnaire was adopted based on (Kuorinka et al., (1987). Furthermore, to determine the WMSD risk, a formula which Risk = Likelihood x Severity (Ayyub, 2003) was applied. Table 1 depicted the severity scale whilst Table 2 depicted the likelihood scale applied for this research.

Table 1 Severity

Scale	Severity
1	Comfortable all the time
2	Always comfortable
3	Slightly Discomfort
4	Medium discomfort
5	Very discomfort

Table 2 Likelihood

Scale	Frequency/Likelihood
1	Rarely
2	Frequently
3	Constantly

Subsequently, the risk matrix used for this research in order to distinguish risk level of WMSD was developed. The development of the risk matrix was based on the adaptation and modification from the Guidelines of Hazard Identification, Risk Assessment and Risk Control – HIRARC (DOSH, 2009). Post to the modification, the risk matrix was sent to experts of OSH for comments and suggestion of improvement. The experts selected are DOSH officers, occupational health doctors and academicians from renowned public universities. After minor modification, the finalised risk matrix for WMSD was produced as depicted in Table 3.

Table 3 Risk Matrix (DOSH, 2009)

Risk Rating	Risk Level	Action
0-3	Low Risk	Acceptable; further reduction may not necessary
4-8	Medium Risk	Requires a planned approach to control the hazard and applies temporary measure if required.
9-15	High Risk	Requires immediate action to control the hazard as detailed in the hierarchy of control.

The target population for this study was the staffs that work with computer in BP Business services Centre office, Bangsar, Kuala Lumpur. The study chose 300 office workers using simple random sampling procedure, which gives everyone an equal chance of being selected. The sampling number was determined based on sampling table introduce by Krejie and Morgan (1970). The data has been analysed quantitatively using the Statistical Package for the Social Sciences (SPSS) version 20. Descriptive and inferential analyses have been chosen as the data analysis methods. Descriptive percentage will be used to determine the prevalence rate of MSD. Whilst, ANOVA analysis techniques was used to analyse the significant difference the hours of daily VDU usage and the risk-level of WMSD.

3.0 RESULTS AND DISCUSSION

This section reports the results of this research results obtained from the statistical data analyses. Furthermore, this section also would discuss the findings of the results.

3.1 Descriptive Analysis

Table 4 depicted the results of descriptive analysis.

Table 4 Descriptive Analysis

Demographic Data		WMSD	
		Yes	No
Gender	Female	153 (51%)	29(9.7%)
	Male	103 (34.3%)	15 (5%)
Age	22-35y	141 (47%)	27 (9%)
	36-45y	76 (25.3%)	12 (4%)
	46-55y	32 (10.7%)	5 (1.7%)
	≥56	7 (2.3%)	0 (0%)
Duration Computer usage Daily	5-7 hours	139 (46.3%)	37 (12.3%)
	≥8 hours	117 (39%)	7 (2.3%)

Based on the results in Table 4, the prevalence rate of WMSD is 85.3%. There was a sum of 153 (51%) of female workers experience a musculoskeletal symptom and the remaining 34.3% were male. Majority (47%) of the respondents who had musculoskeletal symptoms was within age 22-35 years old, 25.3% within age 36-45 years old, 10.7% within the age 46-55 years old and only 2.3% at the age more than 56 years old. None of the respondent are working with a computer below than 5 hours daily. There was 46.3% of the respondent who have reported to have musculoskeletal symptoms, work with VDU for 5-7 hours daily and 39% work with a computer more than 8 hours daily.

Subsequently, the results revealed that the entire respondents are working with VDU for more than 5 hours daily. A total of 46.3% of the respondents who are working with computer for 5-7 hours daily reported to experience high risk in lower back symptoms (60.2%) followed by neck (48.3%), shoulder 39.2%) and wrist/hand (11.4%). Respondents who are working with a computer more than 8 hours reported having high risk in lower back (100%), shoulder (100%), neck (87.1%), and wrist/hand (77.4%). On the other hands, respondents who work more than 8 hours have also reported to experience mid back symptoms (16.1%). The risk of getting musculoskeletal symptoms in all body regions is higher when there is an increasing in the duration of daily computer usage. Based on the descriptive analysis, the results show that the prevalence of WMSD among clerical workers in BPBSC is high which is 85%. Furthermore, all respondents who work with VDU for 5-7 hours are found to be at low and medium risk of WMSD but 14 of respondents who were at high risk of WMSD are those who work with VDU for more than 8 hours. The study also revealed that 100% of the respondents who work more than 8 hours at VDU terminal are having musculoskeletal discomforts symptoms in lower back as well as shoulder. This result is similar to Hernandez et al. (2003) who concluded that VDU usage hours increase the risks of WMSD. Besides, these results also matched with previous study who determined that the risk of WMSD among workers are influenced by working hours with VDU (Robertson et al., 2013; Piranveyseh et al., 2016; Cho et al., 2012; Mahmud et al., 2014; Mozafari et al., 2015). Fig. 1 expresses the WMSD prevalence (divided into body reign) based on the daily VDU usage hours.

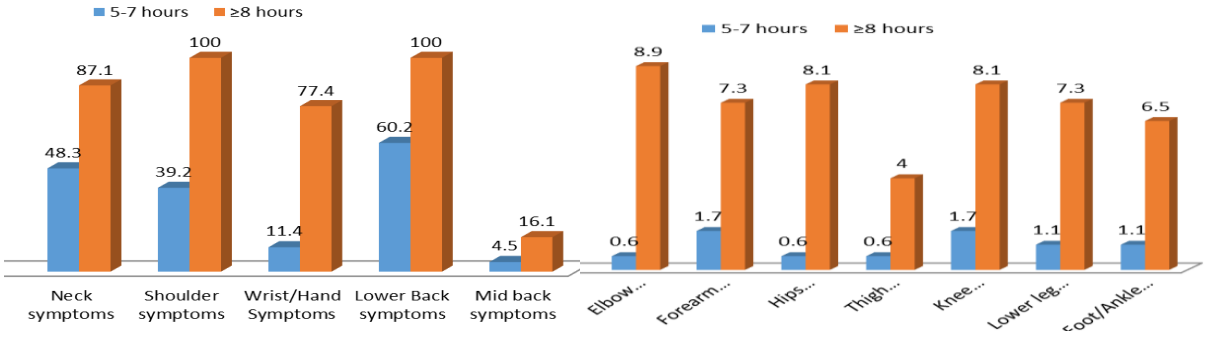

Figure 1 MSD Prevalence According to VDU Usage Duration

In terms of risk-level towards WMSD, the analysis determined that the respondents experienced higher WMSD risk when they work longer with VDU. A total of 176 respondents who work 5-7 hours with VDU, and 77 of them at the low risk-level of getting WMSD whilst the remaining 99 respondents are at medium risk-level. On the other hands, 87 respondents who work with VDU for more than 8 hours daily are at medium risk-level, whilst, the remaining of 14 respondents who work using VDU for more than 8 hours a day were at high risk level of getting musculoskeletal diseases. These results are depicted in Table 5. From the results, it could be said that the level of WMSD risks among the respondents is depend on the duration of VDU usage. This finding matched with Wu et al., (2012) who found in their research that daily VDU use had a significantly elevated the odds ratio for musculoskeletal complaints in comparison with nonusers.

Table 5 WMSD Risk Level According to VDU Usage Duration

Duration of computer usage	Low Risk	Medium Risk	High Risk
< 5 hours	0	0	0
5-7 Hours	77	99	0
≥8Hours	23	87	14

3.2 Inferential Analysis

Subsequently, ANOVA has been performed to determine the significant differences between WMSD risks on the body reigns and VDU usage hours/ duration.

Table 6 ANOVA Analysis for VDU Daily Usage Duration and Neck Risk

		Sum of Squares	df	Mean Square	F	Sig.
Duration of VDU Usage	Between Groups	19.969	2	9.984	56.186	.000*
	Within Groups	52.778	297	.178		
	Total	72.747	299			

* significant at the 0.05 level.

As expressed in Table 6, it could be stated that the difference between WMSD risk level towards neck and their working duration with VDU is statistically significant. Similarly, as depicted in Table 7, a statistically significant different found between the duration of VDU usage and MSD risks towards shoulder among the office workers.

Table 7 ANOVA Analysis for VDU Usage Duration and Shoulder Risk

		Sum of Squares	df	Mean Square	F	Sig.
Duration of VDU Using	Between Groups	17.522	2	8.761	47.117	.000
	Within Groups	55.225	297	.186		
	Total	72.747	299			

* significant at the 0.05 level.

The results of ANOVA analysis performed on VDU usage duration and WMSD risk toward lower-back also revealed a statistically significant difference. The result is depicted in Table 8.

Table 8 ANOVA Analysis for VDU Usage Duration and Lower Back Risk

		Sum of Squares	df	Mean Square	F	Sig.
Duration of VDU Usage	Between Groups	8.730	2	4.365	20.252	.000
	Within Groups	64.016	297	.216		
	Total	72.747	299			

* significant at the 0.05 level.

Based on the results determined from the analysis, it could be stated that there are statistically difference between the hours of VDU usage and the risk of WMSD for shoulder, neck and lower-back among the respondents. Previous study also found that working with same position at long time could imposed to WMSD in low back and shoulder (Gopal, Thomas & Sreedharan, 2012). Moreover, Ming, Narhi and Siivola (2004) determined from their review study that intensive computer using had caused neck and shoulder pain. Hakala, Rimpela, Saarni and Salminen (2006) found that using computer at work for more than three hours is the threshold for neck and shoulder pain.

Table 9 ANOVA Analysis for VDU Usage Duration Wrist/Hand Risk

		Sum of Squares	df	Mean Square	F	Sig.
Duration of VDU Usage	Between Groups	19.720	2	9.860	55.227	.000
	Within Groups	53.026	297	.179		
	Total	72.747	299			

* significant at the 0.05 level.

Furthermore, there is also a statistically different determined for the VDU usage hours and WMSD risk towards wrist or hand (Table 9). Lassen et al., (2004) found that continuous duration of keyboard using time were statistically significant for wrist/hand pain conditions. Borhany, Shahid, Siddique and Ali (2018) determine that computer usage caused WMSD at lower back, neck, shoulder as well as wrist and hand. Moreover, higher keying activation force, use of keyboard with the j-key >3.5 cm above the table surface, and increased radial wrist deviation during mouse use is found to predict hand/arm paint among workers (Gerr et al., 2002).

4.0 CONCLUSION

It is known that computers, have unfortunately become a fundamental part of our daily lives. This study concludes that working longer with VDU could expose workers to high risk of WMSD among office workers. This paper has also revealed that the WMSD experienced by office workers in BPBSC is significantly different based on the hours they are working with VDU. This finding showed that the level of WMSD risk towards the body reigns among workers is different according to the usage hours of the VDU. Specifically, in BPBSC case, the length of VDU usage duration is significantly difference towards WMSD risk in neck, lower back, hand/wrist and shoulder body regions. This could be concluded in this study that the longer hours the workers work with VDU, the higher the risk of WMSD they are facing, specifically in those mentioned body reign. Thus employers shall take appropriate action in order to mitigate the risk and avoid musculoskeletal diseases among the workers. Promoting the ergonomic adjustments among workers and increasing the exercise during work (Ming et al., 2004), imposed mini break to the involving workers (Wu et al., 2012) and ergonomic training (Sirajudeen, Alaidarous, Waly & Alqahtani, 2018) are among the appropriate control measures that could be applied by the management of BPBSC in order to mitigate WMSD risks.

5.0 FUTURE RESEARCH

This research could be a preliminary empirical evidence for the management in terms of mitigating WMSD risks among the employees as well as controlling ergonomic hazards at their workplace. This research's findings also could contribute to the body of knowledge as an additional empirical evidence in ergonomic area. However, this research was limitedly conducted in BPBSC, therefore, the results could not be generalized. It is suggested that similar research should be expanded to other workplace in the same industrial sector. In addition, although this research has been conducted by an occupational health nurse and experienced OSH officers, an involvement of occupational health doctor in data collection, for example to verify the WMSD symptoms could increase the validity of the research.

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