

Correlation between Computer Workstation and Location of Musculoskeletal Disorders

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Abstract

Background: The use of computer has been widely increased. This intensifies the risk of musculoskeletal disorders on long-term office workers. This study aims to find out the characteristics of musculoskeletal disorders in office workers with computer workstation which then lead to the presence or absence of the correlation between the two in order to avoid the pains endured.

Methods: This was a cross-sectional study carried out from September–November 2014 in Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia. Seventeen samples were obtained from three different departments (finance and academics) by total sampling. The data was collected by validated questionnaire and it was analyzed by using simple linear regression method.

Results: From 17 samples in total, 16 claimed that their workstation needs to be evaluated. Furthermore, the prevalent areas of musculoskeletal were shoulders (12 persons), lower back (10 persons), neck (9 persons), knee (9 persons), upper back (7 persons). The analysis using simple linear regression method showed no significant correlation between workstation characteristics and musculoskeletal disorders (p-value = 0.515).

Conclusions: There is no correlation found between workstation characteristics and musculoskeletal disorders. [AMJ.2016;3(2):323–8]

Keywords: Musculoskeletal disorders, office workers, workstations

Introduction

Computer usage has been widely increased recently. In United States¹, computer users increased from 8.2% in 1984 to 75.6% in 2011. This increase was accompanied by the increased risk of musculoskeletal disorders. From various studies, it was discovered that musculoskeletal disorders were common in office workers using computers.^{2,3} Previous studies reported that musculoskeletal disorders were the most common occupational diseases and accounted for 60% of all occupational diseases.^{2,4-6} Several studies proved that musculoskeletal disorders were responsible for declining productivity.^{7,8} Those decline reported by prevalence of 56%, by a study in Finland.⁸ Poor ergonomic conditions were known to play roles in the incidence of musculoskeletal disorders.² Meanwhile good ergonomic conditions help reduce the number

of musculoskeletal disorders.^{3,9,10}

Until now, research on risk factors for musculoskeletal disorders on computer operators are more focused on the human factors (e.g. age, sex, body mass index (BMI)) and environment (e.g. work duration).^{4,6,11} Meanwhile other studies discovering factors that related to technology (e.g. computer, computer workstation components such as tables and chairs) were less common.³ Therefore, this study aimed to investigate the characteristics of computer workstations and musculoskeletal disorders in office workers as well as to determine whether there is a correlation between these variables in order to avoid musculoskeletal disorders.

Methods

This study was carried out from September

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to November 2014 in Faculty of Medicine, Universitas Padjadjaran, Bandung, West Java, Indonesia. This research used observational cross-sectional design, with descriptive and analytic properties. Data were obtained through Nordic Musculoskeletal Questionnaire (NMQ) to determine the location characteristics of musculoskeletal disorders.¹² After that, to determine the characteristics of computer workstations, a questionnaire based on Computer Workstation eTool from OSHA that has been modified with pictures and direction to complete the questionnaire was used.¹³ The questionnaire had undergone validity test respectively. Ethical exemption had been approved by Health Research Ethics Committee, Faculty of Medicine, Universitas Padjadjaran.

The study population was obtained from three sub-sections, considered as the representative of the administrative workers of the Faculty of Medicine, Universitas Padjadjaran who works in long-term at their workstations. Through total sampling, 23 samples obtained from financial and academics department, in Faculty of Medicine Universitas Padjadjaran consisting of 13 from division of finance, 10 from academics sub-division (5 from *unit Program Studi Profesi Dokter* and 5 from *unit evaluasi Program Studi Sarjana Kedokteran*). *Unit Program Studi*

Profesi Dokter were responsible for academic administration of clinical clerkship program, while *unit evaluasi Program Studi Sarjana Kedokteran* were responsible to evaluate academic progress of undergraduate program. From 23 samples, 21 were able to be included in the study after accepting to participate in the research. The selected samples work 2 years minimum with >4 hour/day use computer as the work tool.¹¹ Meanwhile, 2 samples could not complete the questionnaire. From 21 samples selected, 4 must be excluded due to history of musculoskeletal disorders diagnosed by doctors. Hence, total samples analyzed are 17.

Workstations were defined as the place of workers doing their activities such as typing, editing, and processing data. Workstation components analyzed in this study were desk and chair. Musculoskeletal disorders were defined as pain, complaints, or discomfort that was felt according to workers from his/her job. Results were categorized in nominal scale 0 for answer "no" and 1 for answer "yes" at the questionnaire then transformed into score. Maximal score for workstations are 10 and that means good. Meanwhile, maximal score for musculoskeletal disorders are 28 and that means poor. Criteria for workstation to be "good" are when every question was answered "yes". Whereas if there is one "no" answers the

Table 1 Respondent Characteristics

Characteristics	n	Mean (Standard Deviation)	Minimum	maximum
Sex				
Male	14			
Female	3			
Age (years)		36.65(6.32)	29	49
<35	8			
≥35	9			
BMI (Kg/m ²)		23.48(3.97)	17.53	33.06
Underweight (<18.5)	2			
Normal (18.5-24.9)	11			
Overweight (≥25)	4			
Department/sub-division				
Finance	8			
Unit PSPD	5			
Unit Evaluasi PSSK	4			

Table 2 Workstation Characteristics Based on Department/Sub-Division

Components	Total Respondent		Department/Sub-Division					
	(n=17)		Finance		Unit PSPD		Unit Evaluasi PSSK	
	Good	Need Evaluation	Good	Need Evaluation	Good	Need Evaluation	Good	Need Evaluation
Chair	3	14						
Backrest	12	5	6	2	2	3	4	0
Seat	6	11	4	4	2	3	0	4
Armrest	8	9	6	2	2	3	4	0
Desk	5	12						
Work Area	6	11	3	5	2	3	1	3
Below Work Area	10	7	5	3	3	2	2	2
Work-station	1	16						

workstation needs to be evaluated. The same criteria applies in evaluating component of desks and chairs.¹³ Data from the sample were calculated using statistical software. Statistical analysis method used was simple linear regression. Results were presented in table and graphic with explanation and discussion.

Results

The result showed that the majority of respondents are male (14 of 17). Based on age group, it was discovered that 9 people aged above 35. Based on BMI, it was found that 2 people were underweight, 11 were normal, and 4 were overweight. Furthermore, based on department/sub-division of workplace, respondent were distributed into 8 people

from Finance, 5 people from *unit Program Studi Profesi Dokter (PSPD)*, and 4 people from *unit evaluasi Program Studi Sarjana Kedokteran (PSSK)* (Table 1).

Computer workstation characteristics were presented above (Table 2). Generally, respondents considered their workstation as need evaluation (16 of 17). Observed from the components, seat condition and work area (area above the desk) were mostly considered by the respondent as need evaluation (11 of 17) meanwhile the majority of respondents admit their backrest as good (12 of 17). In finance division, work area (area above the desk) were considered mostly as need evaluation (5 of 8) whilst backrest and armrest were considered good (6 of 8). From unit *PSPD* it was found that (3 of 5) respondents stated that their backrest, seat, armrest, and work area need evaluation,

Table 3 Characteristic of Location of Musculoskeletal Disorders

Complaint	Yes	No
	n=17	
Neck	9	8
Shoulders	12	5
Upper Back	7	10
Elbows	3	14
Lower Back	10	7
Wrist-Hands	6	11
Hips-Tighs	6	11
Knees	9	8
Ankles/Feet	6	11

Table 2 Workstation Characteristics Based on Department/Sub-Division

Respondent Characteristics (n= 17)	Age (years)		Sex		BMI (kg/m2)		
	<35	≥35	Male	Female	<18.5	18.5-24.9	≥25
Total	8	9	14	3	2	11	4
Musculoskeletal Disorders location							
Neck	5	4	7	2	0	6	3
Shoulders	5	7	10	2	1	7	4
Upper Back	4	3	6	1	1	4	2
Elbows	1	2	3	0	0	2	1
Lower Back	5	5	9	1	2	6	2
Wrist-Hands	1	5	4	2	1	4	1
Hips-Thighs	2	4	6	0	1	2	3
Knees	3	6	8	1	1	6	2
Ankles/Feet	3	3	5	1	1	3	2

Note: *BMI : Body Mass Index

then below work area (area below the desk) were admittedly good by the respondent (3 of 5). In *unit evaluasi PSSK* sub-division, it was discovered that (4 of 4) respondents stated that their seat need evaluation and (4 of 4) stated that backrest, and armrest on their workstation are good.

Table 3 showed the characteristic of location of musculoskeletal disorders. Body

location that were generally affected by musculoskeletal disorders were shoulders (12 of 17), lower back (10 dari 17), neck (9 of 17), knees (9 of 17), and upper back (7 of 17). Respondents are less likely had complaints in wrist-hands (6 of 17), hips-thighs (6 of 17), ankles/feet (6 of 17), and elbows (3 of 17).

Based on respondents characteristics, it was found that location of musculoskeletal

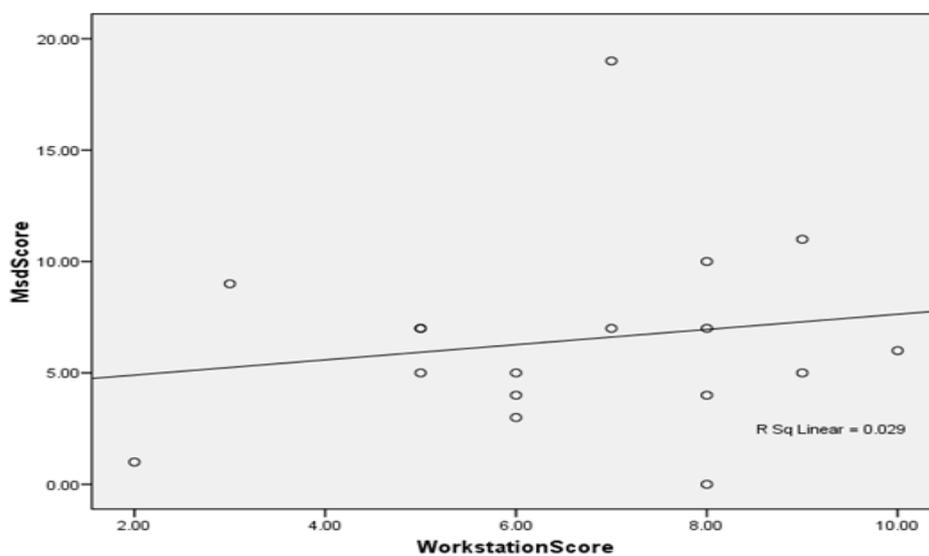


Figure 1 Correlation Between Computer Workstation and Location of Musculoskeletal Disorders

disorders in the age group below 35 were generally shoulders, lower back, and neck (5 of 8) respectively, while in the age group above 35 usually were shoulders (7 of 9). Result showed that male were mostly suffering from complaints of the shoulders (10 of 14) while female are mostly suffering from complaints of the shoulders, neck, and wrist-hands (2 of 3) respectively. Observed from the BMI, underweight respondent (BMI <18.5 kg/m²) were more frequently experiencing complaints in lower back (2 of 2) while in normal weight (BMI 18.5-24.9 kg/m²) and Overweight respondents (BMI ≥25 kg/m²) complaints were more frequent on the shoulders (7 of 11) and (4 of 4) respectively (Table 4).

Correlation between computer workstation and location of musculoskeletal disorders (MSD) were analyzed in form of workstation score and musculoskeletal disorders score using simple linear regression statistical test. Those score were plotted against scatter plot graphic in order to do the statistical test. Afterwards, it was found that there was a tendency of increase workstation score proportionate to the musculoskeletal disorders scores (Figure 1).

However, after statistical analysis of simple linear regression was done it was found that (p value = 0.515), because of $p > 0.05$ therefore the interpretations are there is no meaningful correlation between computer workstation and location of musculoskeletal disorders.

Discussion

Results of this study show that the majority of respondent consider their workstation conditions need to be evaluated (16 of 17). This finding differs from previous study in Lampung, Indonesia¹¹ which stated that the respondents already had good workstation.

This study reveals that musculoskeletal disorders usually affect office workers who use computers like the previous studies.^{2,3} Musculoskeletal disorders with high prevalence occur at the back region and upper extremities such as head/neck, and shoulders. This finding corresponds with previous studies.^{2,4,6,14} Based on age of the respondent, this study shows a tendency of increasing age proportionate to the increase of musculoskeletal disorders similar to the previous studies.^{6,14} Based on BMI of respondents, this study shows a tendency of increasing BMI proportionate to the increase of musculoskeletal disorders in line with a study from India.¹⁵ However, this study did not show any difference that states female tend

to have more complaints at the region of back and upper extremities such as head/neck, and shoulders like the study in Thailand.²

Good workstation characteristics are one of the ergonomic components in the office workers who operate a computer to produce good seating position. This can significantly reduce the incidence of musculoskeletal disorders.^{3,9,11,14} The results of this study differ from other studies that state good ergonomic factors could reduce musculoskeletal disorders. This study found no significant correlation between the workstation characteristics and musculoskeletal disorders. This is due to the sample size of this study that was too small compared to the previous studies.^{2,11,14} There are several limitations of this study. Questionnaire given to the respondents tends to be subjective in assessing the condition of the computer workstation thereby increasing the possibility of bias. Moreover, seating posture, physical activity outside of working hours, and the number of breaks during work hours is not considered in this study. This can be a confounding variable that can change the results. Then, due to the time and resources limitation, the researchers obtained too small samples to get significant correlation.

It is expected that further research could increase the sample size to obtain a significant results, use standardized surveyor to minimize bias, assess seating posture, and assessing physical activity outside working hours to minimize confounding variables. For office workers, it is recommended to improve seating position at work, rest and stretch every 30-60 minutes while using the computer to avoid the incidence of musculoskeletal disorders. For the office management, it is recommended to evaluate the workstation because it is important to support the posture/seating position of the workers. Therefore, it is expected to reduce the incidence of musculoskeletal disorders.

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