Musculoskeletal Pain And Teleworking In Times Of The Covid-19 Pandemic At Mulawarman University

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Abstract. The use of computers in the last two decades has increased rapidly, and escalated as a result of the increasing virtual activities during the Covid-19 pandemic where learning and working are carried out from home. This study used the Cornell Musculoskeletal Discomfort Questionnaires (CMDQ) in the evaluation of musculoskeletal discomfort. The collected data was processed using statistical software and assessed using univariate analysis to obtain descriptive information and descriptions of musculoskeletal discomfort. Using the Mann Whitney test for bivariate analysis to see the effect of gender and working hours for a week on the CMDQ Score. Kruskal Wallis test was used to analyse the relationship of Age and BMI with the CMDQ Scores; and the Spearman Rank test to see the relationship between work stress and BMI with the CMDQ scores. Computer users, either daily or weekly, were more associated with hand and arm MSDS complaints compared to neck and shoulder MSDS. Work stress can increase the likelihood of musculoskeletal complaints.

1 Introduction

The COVID-19 pandemic was confirmed to have spread to Indonesia in March 2020. Through the Ministry of Health of the Republic of Indonesia, the government has implemented various policies including the Government Regulation Number 21 of 2020 on Large-Scale Social Restrictions to accelerate COVID-19 handling. In response to the implementation of the regulation, the Circular Letter of East Kalimantan Governor Number 440/1871/0213-II/B.WELFARE dated March 17, 2020 concerning a follow-up related to preventing the spread of Corona Virus Disease 19 (COVID-19) within the scope of East Kalimantan Provincial Government was issued to enforce preventive measures on the COVID-19, one of which was by doing Physical Distancing and Work From Home (WFH) [1]. In an effort to reduce the transmission of Covid-19 in the primary to tertiary education

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environment, the Indonesian government issued Learning from Home Policy during the pandemic, and has continued to this day. As a result, since March 2020, the process of studying and working has been remotely conducted from home by the entire academic community of Mulawarman University.

The use of computers in the last two decades has increased rapidly, and escalated due to the increasing virtual activities during the Covid-19 pandemic where learning and working are conducted from home. In 2000, 80% of workers stated that they used computers for work. Computer usage were associated with several health complaints such as complaints of skeletal muscle disorders (musculoskeletal disorders) or MSDS where the rate of occurrence was between 10% to 60% [2] and complaints of eye fatigue or computer vision syndrome rated at 79.4% [3]. In developing countries, MSDS could be a serious problem for it diminished the work quality and efficiency thus impacting the economic and social sectors [4]. According to the Global Burden of Disease (GBD), one of the leading causes of losses in life expectancy due to a disability (Years Lived with Disability) in Indonesia is MSDs. In the cases of children aged below 5, and adults aged 15 to 49 (productive age), the primary risk factor is occupational risks. In 2010, in regards to movement system disorders (MSDs), Indonesia was ranked 6th and 7th in the occurrence of Low Back Pain and Neck Pain respectively [5].

Musculoskeletal Disorders (MSDs) are disorders and or injuries to the muscular and skeletal systems of the human body resulting from imbalance of activity loads on the ability of the muscles and skeleton, which directly or indirectly lead to a significant reduction in work productivity [6].

2 Materials And Methods

2.1 Study Population

This is a descriptive observational type of research conducted with a sample of 746 members of academic community of Mulawarman University consisting of lecturers, education staffs and students from the entire population who filled out an electronic survey questionnaire (google form) distributed through contacts and social media. Data collection was administered in July 2020, with Ethical Approval Number 18/KEPK-FK/VI/2020, issued by the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Mulawarman University.

2.2 Measures

This study used the Cornell Musculoskeletal Discomfort Questionnaires (CMDQ) to assess musculoskeletal discomfort, developed by Dr. Alan Hedge and ergonomics graduate students at Cornell University. These questionnaires were based on a previous research studies on musculoskeletal discomfort among office workers [7]. The questionnaire was used in the US and other countries as a tool for researching levels of musculoskeletal discomfort with the validity and reliability were estimated with Cronbach alpha = 0.986 [8].

The CMDQ contains questions regarding musculoskeletal pain, or discomfort in any part of the body during the past one week. (Image1). The questionnaire has been widely used in various occupations such as health services and machine operations in assessing musculoskeletal pain. The musculoskeletal discomfort score was calculated according to the CMDQ scoring guidelines for determining and calculating the level of discomfort.

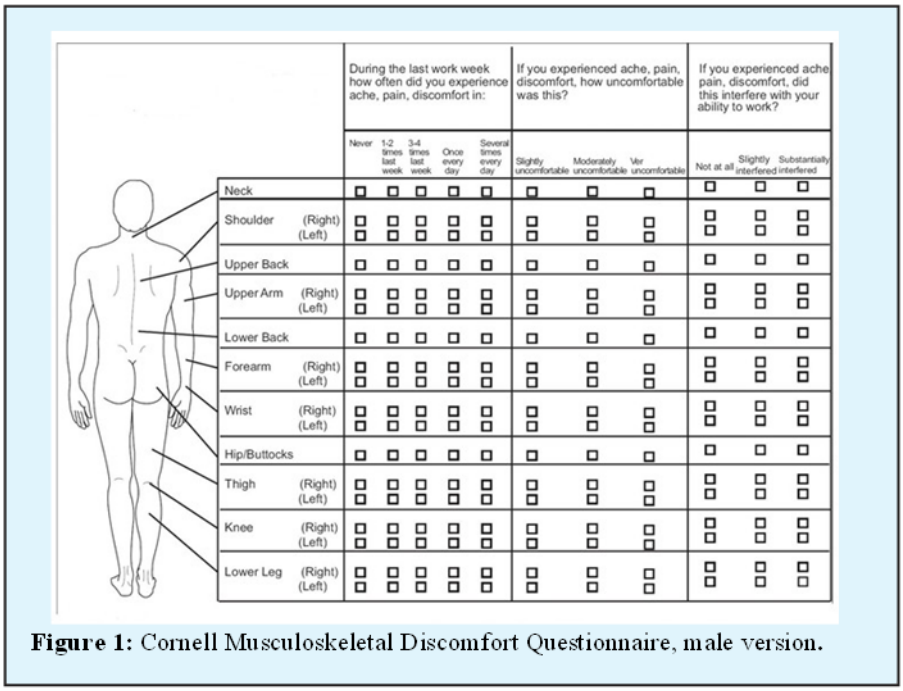

Figure 1: Cornell Musculoskeletal Discomfort Questionnaire, male version.

The assessment of musculoskeletal discomfort was described as follows: First, the Frequency of discomfort recorded and calculated as: “Never (0), 1 or 2 times/week (1.5), 3 or 4 times/week (3.5), every day (5), or several times every day (10)”. To reach the level of musculoskeletal discomfort, it will then be multiplied by the severity level ("slightly uncomfortable = 1, moderately uncomfortable = 2, very uncomfortable = 3") and the level of Interference ("Not interfered = 1, slightly interfered = 2, substantially interfered = 3”).

2.3 Statistical analyses

Statistical software was used as the tool to assist in analysing the collected data. In order to obtain descriptive information and descriptions of musculoskeletal discomfort, the collected data was assessed using univariate analysis. In addition, Mann Whitney test was used for bivariate analysis to examine the effect of gender and a week worth of working hours on the CMDQ Score. Furthermore, Kruskal Wallis test was used in evaluating the relationship of Age and BMI with the CMDQ Scores, and the Spearman Rank test to analyse the relationship between work stress and BMI with the CMDQ scores.

3 Results

Based on Table 1, the mean values and standard deviations between individual age, height and weight were 26.35 ± 10.22 years, 159 ± 11.05 cm, and 59.04 ± 14.37 kg. the min max values of Working (hours/day) 1-20 hours/day and Working (days/weeks) 1-7 days/weeks.

Table 2 shows that 79.2% of the academic community members felt discomfort in the neck 1-2 times per week or more, and 46.4% of them rated this discomfort as having little effect on their ability to work. 61.8% of the academics experienced lower back discomfort 1-2 times per week or more, and because of this discomfort, 32% of academics estimated that this has little impact on their ability to work. Hips / buttocks are the body parts that receive

the burden due to sitting too long; 58.7% of the academic community felt discomfort there 1-2 times per week or more and 29.6% of them felt that this had little impact on their work performance.

Table 1. Demographic Statistics

	mean	SD	Minimum	Maximum
Age (years)	26.35	10.22	17	62
Height (cm)	159.21	11.05	150	185
Weight (kg)	59.04	14.37	35	165
Working (hours/day)	7.34	3.93	1	20
Working (days/weeks)	6.09	1.32	1	7

Table 3. Total discomfort score

Body parts	Frequency	Discomfort	Interference	Discomfort score	%
Neck	2062	1116	1166	2683189872	26.38
Lower Back	1792.5	890	868	1384742100	13.61
Hip/Buttocks	1757	836	847	1244117644	12.23
Upper Back	1581	807	800	1020693600	10.04
Shoulder_R	1475	776	760	869896000	8.55
Wrist_R	1294	623	656	528842272	5.20
Shoulder_L	1211.5	653	645	510265627.5	5.02
Upper Arm_R	1020.5	526	549	294693867	2.90
Wrist_L	962	503	513	248233518	2.44
Lower Leg_R	847	452	476	182233744	1.79
Upper Arm_L	833.5	444	474	175415076	1.72
Fore Arm_R	829.5	451	450	168347025	1.66
Lower Leg_L	816	446	461	167774496	1.65
Knee_R	811	454	446	164214524	1.61
Knee_L	790	445	443	155736650	1.53
Thigh_R	726	426	426	131751576	1.30
Thigh_L	718	420	415	125147400	1.23
Fore Arm_L	707	397	412	115639748	1.14

Based on the total CMDQ discomfort score (Table 3), it was concluded that when doing WFH, the academic community of Mulawarman University felt the most discomfort in the neck (26.38%), lower back (13.61%) and hips or buttocks (12.23%), while it was less prominent in the right thigh (1.30%), left thigh (1.23%) and left forearm (1.14%).

Table 2. Subjects' variations of estimating the feeling of discomfort by using CMDQ

Body parts	During the last work week how often did you experience ache, pain, discomfort in:										If you experience ache, pain, discomfort, how uncomfortable was this?						If you experience ache, pain, discomfort, did this interfere with your ability to work?					
	never		1-2 times last week		3-4 times Last week		Once every day		several times per day		Sightly uncomfortabl e		Moderately uncomfortab le		Very uncomforta ble		not at all		Slightly interested		Substantially interested	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Neck	155	20.8	305	40.9	127	17	86	11.5	73	9.8	215	28.8	209	28	161	21.6	123	16.5	346	46.4	117	15.7
Shoulder_R	323	43.4	208	27.9	108	14.5	57	7.6	50	6.7	163	21.8	155	20.8	101	13.5	124	16.6	234	31.4	56	7.5
Shoulder_L	383	51.3	190	25.5	89	11.9	45	6.0	39	5.2	148	19.8	137	18.4	77	10.3	128	17.2	188	25.2	47	6.3
Upper Back	314	42.1	192	25.7	118	15.8	68	9.1	54	7.2	154	20.6	154	20.6	115	15.4	118	15.8	221	29.6	80	10.7
Upper Arm_R	434	58.2	167	22.4	80	10.7	32	4.3	33	4.4	143	19.2	106	14.2	57	7.6	113	15.1	152	20.4	44	5.9
Upper Arm_L	470	63	162	21.7	63	8.4	28	3.8	23	3.1	146	19.6	86	11.5	42	5.6	118	15.8	130	17.4	32	4.3
Lower Back	285	38.2	189	25.3	124	16.6	81	10.9	67	9.0	165	22.1	151	20.2	141	18.9	113	15.1	244	32.7	89	11.9
Fore Arm_R	475	63.7	154	20.6	61	8.2	35	4.7	21	2.8	133	17.8	96	12.9	42	5.6	116	15.5	128	17.2	26	3.5
Fore Arm_L	493	66.1	164	22.0	46	6.2	26	3.5	17	2.3	140	18.8	82	11.0	31	4.2	125	16.8	112	15.0	21	2.8
Wrist_R	379	50.8	173	23.2	87	11.7	68	9.1	39	5.2	141	18.9	118	15.8	82	11.0	101	13.5	186	24.9	61	8.2
Wrist_L	453	60.7	153	20.5	65	8.7	49	6.6	26	3.5	131	17.6	96	12.9	60	8.0	106	14.2	133	17.8	47	6.3
Hip/Buttocks	308	41.3	181	24.3	103	13.8	83	11.1	71	9.5	149	20.0	129	17.3	143	19.2	105	14.1	221	29.6	100	13.4
Thigh_R	483	64.7	167	22.4	53	7.1	28	3.8	15	2.0	128	17.2	89	11.9	40	5.4	127	17.0	112	15.0	25	3.4
Thigh_L	487	65.3	169	22.7	47	6.3	26	3.5	17	2.3	129	17.3	87	11.7	39	5.2	131	17.6	106	14.2	24	3.2
Knee_R	475	63.7	167	22.4	53	7.1	27	3.6	24	3.2	136	18.2	99	13.3	40	5.4	127	17.0	125	16.8	23	3.1
Knee_L	483	64.7	165	22.1	45	6.0	29	3.9	24	3.2	134	18.0	91	12.2	43	5.8	126	16.9	115	15.4	29	3.9
Lower Leg_R	463	62.1	171	22.9	63	8.4	24	3.2	25	3.4	132	17.7	100	13.4	40	5.4	130	17.4	122	16.4	34	4.6
Lower Leg_L	473	63.4	165	22.1	61	8.2	23	3.1	24	3.2	132	17.7	94	12.6	42	5.6	125	16.8	117	15.7	34	4.6

Table 4. The effect of gender, working hours a week, age, BMI, work stress on the CMDQ score

Variable	n	Mean Rank	p
Gender			
Man	244	325.00	0.000
Woman	502	397.08	
Work Hours Per Week			
40 Hours	396	403.95	0.000
< 40 Hours	350	339.04	
Age (Years)			
15 - 19	180	435.68	
20 - 24	326	384.58	
25 - 29	34	286.13	
30 - 34	48	373.54	
35 - 39	46	271.93	0.000
40 - 44	48	292.09	
45 - 49	32	297.53	
50 - 54	16	355.88	
55 - 59	11	318.45	
60 - 64	5	385.70	
BMI			
Underweight	116	434.72	
Normal Weight	307	379.73	0.002
Overweight	208	343.05	
Obese	115	350.20	
Work stress			
No Stress	127	17.0	0.000
Low Stress	559	74.9	
High Stress Level	60	8.0	

Table 5. Relationship of Stress to BMI and CMDQ Score

Variable	Stress	
	p	R
BMI	0.791	-0.010
CMDQ Score	0.000	0.163

Bivariate analysis used the Mann Whitney test to see the effect of gender and working hours during the week on the CMDQ Score. Kruskal Wallis test to analyze the relationship between Age and BMI on the CMDQ Score. Computer users, either daily or weekly, were associated with hand and arm MSDS complaints compared to neck and shoulder MSDS. Work stress can increase the likelihood of musculoskeletal complaints.

4 Discussion

The COVID-19 pandemic has forced people to stay indoors more and start working and studying from home. This condition has brought changes in the way of working and studying, where the time spent in front of computers, cell phones, and similar electronic devices got prolonged. The results of the CMDQ shows that most of the academic community reported MSD symptoms, feeling pain only by 1-2 times per week based on the frequency and severity aspects, they considered this condition to have only a small impact on the ability to work/study. According to the results of this study, it is found that the neck, back and buttocks were parts of the body that experienced discomfort the most during the pandemic. Complains

of MSD from the computer users were the consequences of habitually sitting continuously facing the computer in addition to the unstable shoulder posture.

Sengul et al. (2020)) in his study of the imposed lockdown due to the COVID-19 pandemic on musculoskeletal discomfort in Turkey found that during the COVID-19 pandemic, there was a decrease in the frequency of aches, pains and discomforts in the body regions, contrary to a statistically significant increase in the severity level of low back pain, neck pain, and back pain during quarantine compared to those of before the quarantine [9].

Based on the total CMDQ discomfort score (Table 3), it was concluded that when doing WFH, the academic community of Mulawarman University felt the most discomfort in the neck (26.38%), lower back (13.61%) and hips or buttocks (12.23%), while it was less prominent in the right thigh (1.30%), left thigh (1.23%) and left forearm (1.14%).

The results of this study are similar to the findings of Albeeli et al. (2020) on General Office workers in Putrajaya, Malaysia found that most office workers reported MSD symptoms. The prevalence of MSDs symptoms among office workers in any part of the body was high (83.7%), low back pain was reported to be the highest (58.5%) while the lowest was thigh (25.4%) [10].

Correspondingly, it was also discovered in the study of Woo et al (2016) that the use of electronic devices and body posture were associated with the incidence of musculoskeletal problems among students in Hong Kong. 49.9% of respondents reported upper extremity musculoskeletal symptoms, especially in the neck and shoulder areas. 61.8% of them indicated that their discomfort was related to the use of electronic devices [11]. In this study, it was revealed that women complained more about the presence of MSD, and there was a difference in CMDQ scores statistically when viewed by gender. The study of Woo et al (2016) further described a statistically significant difference in terms of exposure to electronic devices and musculoskeletal complaints by gender ($p < 0.05$) [12].

Comparably, the study of Queiroz et al. (2018) reported that the high prevalence of musculoskeletal pain/syndrome was more in adolescent girls. Musculoskeletal pain is mostly reported by those who used at least two electronic devices [13]. Similarly, looking further into Bubrik and Hedge‘s (2016) research, it was discovered that more than 53% of college students experienced musculoskeletal discomfort when using a laptop computer, with a higher prevalence of neck and shoulder discomfort in women than men [14]. Musculoskeletal symptoms of the extremities are felt by workers on the upper part, back, and lower extremities. The results of studies related to occupational injuries increased by 24% for women compared to men. The incidence among women is approximately 50% higher than that of men [15].

This study reveals that there was a difference statistically in CMDQ scores when viewed from the length of computer use (table 4). Gerr et al. (2004) stated that daily or weekly computer users were more associated with hand and arm MSDS complaints compared to necks and shoulders MSDS. The results of epidemiological studies of posture and MSDS have not been completely consistent. The reasons for the inconsistency could be due to variations in cross-sectional study design, inaccurate posture measures used, and difficulties in analysing some of the related variables. Despite the inconsistency, it appears from the literature that posture is a fairly large independent risk factor for MSDS among computer users [16].

In addition, a significant difference in CMDQ scores was seen when viewed from the presence or absence of stress. These data are in accordance with the research of Deveroux et al. (2004) that individual stress reactions (e.g. depression and psychosomatic symptoms) and job stress can increase the likelihood of musculoskeletal complaints [17]. Somayeh (2016) stated that there was a significant correlation between stress and musculoskeletal complaints. Similarly, the average working hours per day, work experience, fatigue, and BMI were significantly associated with musculoskeletal symptoms [18]. Ragnhild Lier and colleagues

(2016) stated that parental pain is strongly associated with the prevalence of chronic musculoskeletal pain (CMP) in the offspring. The offspring of both parents reported CMP had a relative risk of 2.01 if they had a BMI of 25 kg/m^2 compared to the normal body weight of pain-free parental offspring [19]. Compared with offspring from parents without chronic musculoskeletal pain, then the adverse effects of pain from parents on the offspring are at lower risk (RR: 1.82.95% CI: 1.32, 2.52) versus high (RR: 1.32, 95% CI: 0.95,1.84) in people who have a high level of physical activity in leisure [19]. This is in accordance with the results of Setyowati's research, 2018 that Physical activity is a perspective factor to the incidence of obesity in workers [20].

5 Conclusion

Computer users, either daily or weekly, were more associated with hands and arms MSDS complaints compared to necks and shoulders MSDS. Work stress can increase the likelihood of musculoskeletal complaints.

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