

ORIGINAL ARTICLE

Prevalence Study of the Risk for Musculoskeletal Disorders Among University Students During the Covid-19 Pandemic

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Abstract: The COVID-19 pandemic has greatly impacted human daily routines. At higher education institutions, the adoption of online classes has resulted in increasing of electronic devices engagement among the university community, which may increase the risk for musculoskeletal disorders (MSDs). Currently, there is no prevalence study on the risk for MSDs among the university students in Malaysia during the COVID-19 pandemic. Thus, this study was done to investigate the matter. Objectives of the study are: (i) to determine the prevalence of the MSDs symptoms among the university students during the COVID-19 pandemic; (ii) to determine the correlation between the credit hours registered and the number of body parts experiencing MSDs symptoms and the level of discomfort of the MSDs symptoms; (iii) to determine the correlation between the daily hours engaged with the electronics devices for the online classes and the number of body parts experiencing MSDs symptoms and the level of discomfort of the MSDs symptom; and (iv) to determine the correlation between the level of discomfort reported and the level of interference to work reported. 137 students were responded to the questionnaire and they were undergraduate Engineering students from the International Islamic University Malaysia (IIUM) [male, $n = 94$; female, $n = 41$] between 19-29 years of age [mean = 22.94; SD = 1.73]. The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was used, in which, respondents were asked to report their body parts that experiencing MSDs symptoms (total of 12 body parts) and its frequency. Moreover, they were also asked to report the level of discomfort (3 levels – slightly, moderate, very uncomfortable) and level of interference (3 levels – not at all, slightly, substantially). The results reveal that: (i) the average number of body parts that experiencing the MSD symptoms was 6.95/12 [SD = 3.52]; (ii) the average score of the level of discomfort was 1.51/3 [SD = 0.64]; (iii) the average score of the level of interference was 1.59/3 [SD = 0.64]; (iv) the most affected body parts are neck, shoulder, upper back, and lower back; (v) there is no correlation between the credit hours registered and the number of body pain reported as well as the level of discomfort; (vi) there is correlation between the daily hours electronics devices engagement with the number of body pain reported, $r(137) = 0.206$; $p < 0.05$ and with the level of discomfort reported, $r(137) = 0.201$; $p < 0.05$; and (viii) there was a strong positive correlation between the level of pain and the level of interference reported, $r(137) = 0.661$; $p < 0.01$. This study shows university students are indeed exposed to the risk for MSDs during the COVID-19 pandemic. In general, the study contributes the prevalence study on the risk for MSDs among the university students during the COVID-19 pandemic due to the implementation of the online classes and focuses on the 3rd Sustainable Development Goals (SDGs) – good health & well being. Detail investigations can be furthered such as considering the differences between the work-related and non-work-related factors and the effect of daily routines e.g. physical activity and study habit.

Keywords: Musculoskeletal disorders; COVID-19 pandemic, college student, Cornell Musculoskeletal Discomfort Questionnaire

1.0 INTRODUCTION

COVID-19 pandemic has impacted so many aspects of human daily routines. Globally, to date, 188,659,676 cases have been recorded with over 4 million of death. In Malaysia, to date, 867,567 cases were reported with 6,503 of death have been recorded [1]. In higher education institutions, one of the affected routines was the adoption of online classes as the platform for teaching and learning. This results the university community – students & lecturers – to spend lots of times engaging with the electronics

devices in order to adopt to the new norm. Engaging electronics devices for a prolonged period have been shown to increased the risk for musculoskeletal disorders (MSDs) among the users [2][3][4][5]. Thus, university community are at risk to be exposed to MSDs.

MSDs are pain or injury that affect human musculoskeletal system such as muscles, ligament, tendon, nerve and joint [6]. MSDs have been shown to be occurred in most workplaces – manufacturing company [7], governmental offices [8], packaging industries [9], hotel industries [10] as well as university [11] – regardless of task involved or work routines. Prior to the COVID-19 pandemic era, the risk for MSDs are already alarming due to the lack of knowledge of ergonomics among the community. In particular, people are not aware of what is ergonomics workstation setup that could potentially minimize the risk for MSDs. In addition, most people are also lack of knowledge on what is a good posture to be adopted while performing their daily routine activities and how to manage their daily routine ergonomically i.e. what is the good posture to be adopted, and how long should a particular posture can be maintained without harming their health.

In Malaysia, the ergonomics discipline can be considered as a new field of sciences. Thus, the risk for MSDs are indeed greater. Moreover, as mentioned earlier, the new norm (i.e. online classes) results in increasing of electronics devices engagement (e.g. laptop, desktop, smartphone, and tablet) and this caused the university community to spent time at the workstation for a longer period. Thus, this new norm somehow may increase the risk for MSDs than it already is.

Currently, there is no prevalence study of the risk for MSDs among the university students in Malaysia during the COVID-19 pandemic. Thus, this study was done in order to investigate the prevalence of the risk for MSDs among the university students during the Covid-19 pandemic. Once available, the study can be furthered so that, the issues of MSDs among the university students can be minimized.

The aim of the study is to provide the knowledge on the risk for the MSDs among university students during the COVID-19 pandemic. To achieve the aim, four objectives have been identified, and they are:

- (i) To determine the prevalence of the MSDs symptoms among the university students during the COVID-19 Pandemic by using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ),
- (ii) To determine the correlation between the credit hours registered and the number of body parts experiencing MSDs symptoms and the level of discomfort of the MSDs symptom,
- (iii) To determine the correlation between the daily hours engaged with the electronics devices for the online classes and the number of body parts experiencing the MSDs symptoms and the level of discomfort of the MSDs symptom, and
- (iv) To determine the correlation between the level of discomfort reported and the level of interference of work reported.

2.0 METHODS

Participants

137 undergraduate Engineering students from the IIUM (male, $n = 94$; female, $n = 41$) between 19-29 years of age (mean = 22.94; SD = 1.73) were participated in the study. Majority of the respondents were Malay ($n = 96$), and the rest were Indian ($n = 2$), Bumiputra ($n = 1$), and others i.e. foreign students ($n = 38$). The total registered credit hours of the semester among them vary between 3-23 credit hours (mean = 17.46; SD = 2.80). During the study, 84 of them residing off-campus, 51 residing on-campus, and 2 were residing on-campus for the half of the semester and the other half residing off-campus. The inclusive criteria for the participants are: (i) undergraduate Engineering students from IIUM and (ii) registered for classes in the current semester, so that the study workload among them are somehow similar.

Apparatus

The apparatus used in the study was the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) questionnaire that was developed by Alan Hedge [12], and it was obtained from the Cornell University website [13]. This questionnaire has been used in other similar studies (e.g. [14], [15], [16], [17], [18]) because its reliability and validity were justified. Thus, it was chosen to be used in this study. The English version of this questionnaire was maintained in consideration of population where the study was conducted consists of local and international students.

The CMDQ questionnaire consists of four main parts: (i) a figure of 12 body parts that need to be referred by a respondent in order to answer the questionnaire; (ii) the first question, in which a participant need to report if he or she experiencing a pain in a particular body part, and if so, how often it was; (iii) the second question, in which a participant need to report the level on comfort for the body part that he or she experienced the pain; and (iv) the third question, in which a participant need to report on how the pain interfere his or her ability to work during the online classes.

The original CMDQ questionnaire was established in the form of pen & paper version. For this study, it was converted into a Google Form version because the study was run via the online platform. In general, is started with the introduction to the MSDs, addressing the confidentiality and voluntary in participating in the study, and confirming the consent from the participants. Then, the demographic questionnaire was follows which includes the gender, age, and race/ethnicity of the participants. After that, several background questions were asked: (i) how many credit hours did you registered for this semester?; (ii) how many of those registered credit hours involves with online classes?; (iii) during the current semester, you are residing at?; (iv) do you have a study workstation at your home?; (v) on average, how many hours do you spends on online classes gadget (desktop, laptop, tablet, smartphone and etc.) in one day?; (v) among the following gadget, which one do you use the most for your online classes?. Finally, the questionnaire ended with the three Cornell Musculoskeletal Discomfort Questionnaire explained earlier, and the participants were asked to submit his or her responses.

Data Collection Procedure

The data collection procedure of the study was done by posted the link of the questionnaire to the potential participants via social media – Facebook, Twitter, WhatsApp and etc. – that actively engage by IIUM undergraduate engineering students such as Kulliyyah of Engineering Student Society, Departmental Student Society, and courses' WhatsApp and Telegram groups. Even though most of the respondents have no issues in answering and submitting the questionnaire, assistant and explanation was given whenever it was requested. The questionnaire was opened in May 11th, 2021 and was closed on June 20th, 2021. After the questionnaire was closed, the collected data was extracted to the Excel File (this is automatic done by the Google Form), and was saved for the data analysis purposed.

Data Analysis

The raw data extracted into the Microsoft Excel software was used in order to perform the descriptive analysis of the data e.g.: (i) the distribution of the participants' demographic based on gender, age, and race/ethnicity; and (ii) the distribution of the participants' general information such as credit hours registered by them, percentage of the credit hours registered that involves with online classes, participants' residency, participants' study area environment – either they have a study workstation or not, average hours that participants spent on their gadget for online classes, and participants' primary gadget for online classes. The data was then being processed in which all the raw data were converted into a numerical value. For instance, for the gender data, instead of male and female, the data was processed such that 1 is represent the male respondents and 2 represents the female respondents so that the necessary calculation (e.g. the percentage) can be done.

For objective number 2, 3, and 4, the collected data was transformed into the Statistical Package for Social Science (SPSS) – version 26. There were included: (i) the total credit hours registered by each participant; (ii) the daily total hours a participant spent on electronic devices for online classes; (iii) total number of body parts that was/were reported by a participant to have MSDs symptom; (iv) the average level of ache, pain, and discomfort that was reported by a participant; and (v) the average level of interferences of the ache, pain, and discomfort on a participant's ability to work on online classes. The data was analyzed using the correlation-bivariate model.

3.0 RESULTS

Descriptive Statistics: In total, there are 137 respondents participated in the study. 96 of the respondents (70%) are male and the other 41 respondents (30%) are female. The respondents were between 19-29 years of age (mean = 22.94; SD = 1.73). In term of the race/ethnicity, 96 (70%) of the respondents are Malays, 2 (1%) are Indian, 1 (1%) is Bumiputra, and 38 (28%) are others – foreign students. Total credit hours registered by the respondent vary between 3-23 credit hours (mean = 17.46; SD = 2.80). 118 (86%) of the respondents reported that all the credit hours registered involved with online classes, while the other 19 (14%) claimed that not all classes that they are registered involves with online classes. 84 (61%) of the

respondents reported that they are resided off-campus during responding to the questionnaire, 51 (37%) of the respondents reported that they are resided on-campus, while 2 (2%) of the respondents reported that they resided on-campus during the first half of the semester, and then resided off-campus during the second half of the semester. 110 (80%) of the respondents reported that they have a dedicated study workstation, while the other 27 (20%) does not a dedicated study workstation. The respondents also reported that the daily hours that they spent on the online classes gadgets are between 0-24 hours (mean = 8.50; SD = 4.50). In term of the primary gadget that was used for the online classes, 112 (82%) of the respondents reported that it was desktop, follow by the smartphone with 13 (9%) respondents, laptop with 11 (8%), and tablet with 1 (1%).

Objective 1: The first objective is to determine the prevalence of the Musculoskeletal Disorder (MSD) symptoms among the university students during the COVID-19 pandemic. On the first question of the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ), the respondents were asked, during the last week, how often did they experiencing ache, pain, or discomfort in the 12 body parts. Thus, the number of body parts that experiencing the ache, pain, or discomfort were totaled for each participant.

The result reveals that, among the respondents, the average number of body parts that experiencing the MSD symptoms was 6.95 out of 12 (SD = 3.52). Table 1 lists the total number of respondents (n) and its percentage (%) for each total number of body parts experienced the MSD symptoms.

Table 1 The total number of respondents and its percentage for each number of body part experienced the MSD symptoms

Number of body parts experienced the MSD symptoms	Number of respondents (n)	Percentage number of respondents (%)	Rank
0	5	3.65	9
1	2	1.46	13
2	5	3.65	9
3	12	8.76	6
4	15	10.95	2
5	14	10.22	3
6	13	9.49	4
7	13	9.49	4
8	12	8.76	6

9	10	7.30	8
10	5	3.65	9
11	3	2.19	12
12	28	20.44	1

It was reported that, majority of the respondents ($n = 28, 20.44\%$) experienced the MSD symptoms in all 12 body parts, and only 5 of the respondents (3.65%) reported that he or she did not experienced any MSD symptoms during the last week. Moreover, Table 1 also shown that 96.35% of the respondents ($n = 132$) experienced at least one MSD symptoms of their body parts. The result agreed to other similar studies – prevalence of MSDs during COVID-19 pandemic – in which majority of the respondents reported to experienced MSD symptoms during the COVID-19 pandemic such as 59.8% in [17] and 76% in [19].

Furthermore, the result also reveals that, among the 12 body parts, the most crucial body parts experienced MSD symptoms reported were the neck ($n = 122; 89.05\%$), shoulder ($n = 109; 79.56\%$), lower back ($n = 108; 78.83\%$), and upper back ($n = 100; 72.99\%$). Table 2 ranks the reported body part that experienced ache, pain and discomfort. This finding aligned with other similar studies during the COVID-19 pandemic, for instance; neck, back, and shoulder were reported to experienced MSD symptoms the most in [19]; neck and back in [17]; back and neck in [20]; shoulder and lower back in [21]; neck, shoulder and back in [22]; and neck in [3] and [23].

Table 2 Rank among the body part that were reported to experienced ache, pain, and discomfort

Body part	Number of respondents (n)	Percentage number of respondents (%)	Rank
Neck	122	89.05	1
Shoulder	109	79.56	2
Upper back	100	72.99	4
Upper arm	66	48.18	7
Lower back	108	78.83	3
Forearm	61	44.53	8
Wrist	68	49.64	6
Hip/buttock	92	67.15	5
Thigh	57	41.61	11

Knee	58	42.34	9
Lower leg	57	41.62	10
Foot	54	39.42	12

On the second question of the CMDQ, the respondents were asked to rate the level of uncomfortable of the ache, pain, and discomfort experienced. The response was scored 1, 2, and 3 for slightly, moderate, and very uncomfortable respectively. It was reveals that the average scored among the respondents was 1.51 out of 3 (SD = 0.64). This shows that, on average the respondents classified the level of uncomfortable to be between the slightly and moderate. Table 3 lists the total number of respondents for each body parts based on the pain level reported. The similar pattern was shown, in which, the most crucial body parts that scored level of discomfort of 2 and 3 are higher for lower back, neck, shoulder, and upper back. This finding aligned with [17].

Table 3 The total number of respondent for each body part based on the pain level reported

Body part	Slightly Discomfort n (%)	Moderate discomfort n (%)	Very discomfort n (%)	Rank (based on Very discomfort)
Neck	53 (39%)	39 (28%)	26 (19%)	2
Shoulder	49 (36%)	33 (24%)	23 (17%)	3
Upper back	41 (30%)	33 (24%)	23 (17%)	3
Upper arm	33 (24%)	19 (14%)	10 (7%)	7
Lower back	41 (30%)	28 (21%)	40 (29%)	1
Forearm	40 (29%)	15 (11%)	9 (6%)	8
Wrist	37 (27%)	18 (13%)	12 (9%)	6
Hip/buttock	41 (30%)	25 (18%)	19 (14%)	5
Thigh	31 (23%)	17 (12%)	7 (5%)	9
Knee	30 (22%)	18 (13%)	5 (4%)	11
Lower leg	31 (23%)	14 (10%)	6 (4%)	10
Foot	31 (23%)	13 (9%)	5 (4%)	11

On the third question, the respondents were asked to rate on how the ache, pain and discomfort experienced has interfered their ability to work during the online classes. The responses were scored 1, 2, and 3 for not at all, slightly, and substantially respectively. It was reveals that the average scored among the respondents was 1.59 out of 3 (SD = 0.64). This shows that, on average the respondents

classified the level of interference was between not-at-all and slightly. Table 4 lists the total number of respondents for each body part based on the interference level reported. Again, the similar pattern was shown, in which, the most crucial body parts that scored level of interference of 2 and 3 are higher for lower back, neck, shoulder, and upper back. This finding aligned with [17].

Table 4 The total number of respondent for each body part based on the interference level reported

Body part	Not at all Interfered n (%)	Slightly interfered n (%)	Substantially interfered n (%)	Rank (based on substantially)
Neck	35 (26%)	56 (41%)	30 (22%)	2
Shoulder	39 (28%)	53 (39%)	21 (15%)	3
Upper back	42 (31%)	44 (32%)	21 (15%)	3
Upper arm	55 (40%)	25 (18%)	7 (5%)	7
Lower back	31 (23%)	51 (37%)	32 (23%)	1
Forearm	56 (41%)	25 (18%)	5 (4%)	8
Wrist	45 (33%)	33 (24%)	11 (8%)	6
Hip/buttock	37 (27%)	43 (31%)	17 (12%)	5
Thigh	44 (32%)	27 (20%)	4 (3%)	10
Knee	47 (34%)	20 (15%)	5 (4%)	8
Lower leg	45 (33%)	23 (17%)	3 (2%)	12
Foot	50 (36%)	17 (12%)	4 (3%)	10

In discussion, the prevalence of MSDs symptoms among the University students shows that majority of the students were experienced ache, pain, and discomfort during the COVID-19 pandemic and the most affected part of the body are neck, lower back, upper back, and shoulder. This is perhaps due to the prolonged duration of the use of computer and smartphone for the online classes [2][3][4][5]. In addition, since the knowledge of Ergonomics is considering new in Malaysia, it is perhaps that students are not aware on how to adopt a good posture during the online class. Moreover, students are also perhaps not familiar on how to setup their study workstation to be ergonomic so that it will minimize the exposure towards the MSDs symptoms. Furthermore, students are also perhaps not aware on how to incorporate a suitable rest period and exercise along the online classes and their daily activity that required them to engaged with the electronics devices especially during the COVID-19 era.

Objective 2: The second objective is to determine the correlation between the credit hours registered and number of body parts experiencing the MSDs symptoms & level of discomfort of the MSDs symptom. Thus, two analyses were done: (i) correlation between the credit hours registered and number of body parts experiencing the MSDs symptoms; and (ii) correlation between the credit hours registered and level of discomfort of the MSDs symptom. For the first relationship, the SPSS output reveals that there was no correlation between the two variables, $r(137) = 0.150$; $p > 0.05$, meaning the number of credit hours registered does not reflect the number of body parts experiencing the MSDs symptom. For the second relationship, the SPSS output reveals that there was also no correlation between the two variables, $r(137) = -0.048$; $p > 0.05$, meaning the number of credit hours registered does not reflect the level of the MSDs symptom. These findings were shown perhaps because, the number of credit hours registered does not reflect their study method. In explanation, registered for a high load of credit hours does not mean a particular student spend a lot of hours engaging with the electronics devices for their online classes and vice versa. Moreover, other confounding factors such as non-work-related (e.g. engaging with online gaming and social media apps) may contribute to this finding in which can be further explored in future research.

Objective 3: The third objective is to determine the correlation between daily hours engaged with the electronics devices for the online classes and number of body parts experiencing the MSDs symptoms & level of discomfort of the MSDs symptom. Thus, two analyses were done: (i) correlation between the daily hours engaged with the electronics devices for the online classes and number of body parts experiencing the MSDs symptoms; and (ii) correlation between the daily hours engaged with the electronics devices for the online classes and level of discomfort of the MSDs symptom. For the first relationship, the SPSS output reveals that there was a positive correlation between the two variables, $r(137) = 0.206$; $p < 0.05$, meaning the higher the average daily hours spent on the electronics devices for online classes, the higher the number of body parts experiencing MSDs symptoms were reported. For the second relationship, the SPSS output reveals that there was a positive correlation between the two variables, $r(137) = 0.201$; $p < 0.05$, meaning the higher the average daily hours spent on the electronics devices for online classes, the higher the level of discomfort of the MSDs symptoms were reported. The

result aligned with similar previous studies [2][3][4][5], in which the massive uses of electronics devices during the COVID-19 pandemic increase the risk for MSDs symptoms among their participants.

Objective 4: The forth objective is to determine the correlation between the level of discomfort reported and level of interference of work reported. The SPSS output reveals that there was a strong positive correlation between the two variables, $r(137) = 0.661$; $p < 0.01$, meaning there higher the level of discomfort reported the higher the level of interference of work was reported. This is true because the more severe the pain experienced, of course it will interfere the ability of one's to do a particular tasks and as in this study the ability to work during the online classes.

4.0 CONCLUSION

The first objective of the study is to determine the prevalence of the MSDs symptoms among the University students during the COVID-19 pandemic. The result reveals that, among the respondents, the average number of body parts that experiencing the MSD symptoms was 6.95 (SD = 3.52), which is more than half of the total body parts being assessed – 12 body parts. In term of the level of discomfort of the MSDs symptoms, the average scored among the respondents was 1.51 (SD = 0.64), which is between slightly and moderate discomfort. As for the level of interferences among the respondents to work during the online classes, it was reported that the average score was 1.59 (SD = 0.64), which is between not-at-all and slightly interfered. In all cases above, the body parts that scored the higher are neck, shoulder, upper back, and lower back. Thus, the first objective is achieved.

The second objective of the study is to determine the correlation between the credit hours registered and number of body parts experiencing the MSDs symptoms & between the credit hours registered and level of discomfort of the MSDs symptom. Both analyses reveal that there was no correlation between the variables being analyzed $r(137) = 0.150$; $p > 0.05$ for the first pair, and $r(137) = -0.48$; $p > 0.05$ for the second pair. Thus, the second objective is achieved.

The third objective is to determine the correlation between daily hours engaged with the electronics devices for the online classes and number of body parts experiencing the MSDs symptoms & between daily hours engaged with the electronics devices for the online classes and the level of discomfort of the MSDs symptom. The first pair shown a positive correlation between the two variables, $r(137) = 0.206$; p

< 0.05, and the second pair also shown a positive correlation between the two variables, $r(137) = 0.201$; $p < 0.05$. Thus, the third objective is achieved.

The fourth objective of the study is to determine the correlation between the level of discomfort reported and level of interference of work reported. The analysis reveals that there was a strong positive correlation between the two variables, $r(137) = 0.661$; $p < 0.01$. Thus, the fourth objective is achieved.

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CONFLICT OF INTERESTS

There is no conflict of interest.

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