

## Relationship Between Level of Physical Activity and Subjective Musculoskeletal Pain Among Work from Home Adults

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### Abstract

**Introduction:** World Health Organization has defined physical activity as any physiological movement that needs energy expenditure and is produced by skeletal muscles. Due to the COVID-19 Pandemic, the government has imposed a lockdown to reduce the infection rate. Hence, many industries have moved to work from home platforms. Based on the studies, it is believed that these restrictions have caused a reduction in physical activity and an increase in sedentary behavior, which leads to musculoskeletal disorders.

**Objective:** The purpose of this study is to determine the relationship between level of physical activity and subjective musculoskeletal pain in adults who work from home.

**Methodology:** An online questionnaire distributed via Google Form links was sent to those who have been working from home (WFH) during and after COVID-19 in the past few years in Malaysia. The collected data was then analysed using the Pearson chi-square test using SPSS version 26 Mac OS. The Baecke Physical Activity Questionnaire and the Nordic Questionnaire were used to determine the participants' levels of physical activity and musculoskeletal pain.

**Result:** This study found that many of the respondents experienced neck pain ( $n = 98$ , 54%), shoulder pain ( $n = 75$ , 41%), and low back pain ( $n = 94$ , 51.9%) during the past year. Further, the study findings revealed a significant relationship between neck ( $p = 0.014$ ) and hip pain ( $p = 0.004$ ) with the work index, wrist pain ( $p = 0.002$ ) with the leisure index, and ankle joint pain ( $p = 0.024$ ) with the work and sport index.

**Conclusion:** According to the findings, WFH decrease the level of participants' physical activity, thus leading to an increase in musculoskeletal pain over the neck, shoulder, and low back.

### Keywords

Physical Activity, Musculoskeletal, Work from Home

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## Introduction

World Health Organization has defined physical activity as any physiological movement that needs energy expenditure and is produced by skeletal muscles. The term "physical activity" refers to any and all types of movement, including those performed for the purpose of transporting oneself to and from work or for recreational purposes. In countries developing economically, levels of inactivity rise, as high as 70 percent due to changes in transportation patterns, increased use of technology for work and relaxation, cultural values, and more sedentary behavior (WHO, 2020). Sedentary lifestyles are the primary factor in the development of non-communicable diseases (NCDs) and deaths which also increases the risk of cancer, cardiovascular disease, stroke, and diabetes of between 20 and 30 percent around the world. It is estimated that between four and five million unnecessary deaths could be prevented annually if the global population led a more active lifestyle (WHO, 2021). Based on a research study on the awareness of physical activity, half of those who were inactive misperceived their physical activity by overestimating the quantity of activity they engaged in. A lower body mass index, higher levels of physical activity (as measured by objective and self-reported measures), a lower intention to increase physical activity, and reduced response efficacy were all associated with overestimation (Godino et al., 2014).

Due to Covid-19 Pandemic, the government have imposed a lock down to reduce the infection rate, which have negative consequences by restricting participation in normal everyday activities, physical activity (PA), travel, and access to many types of exercise (e.g., closed gyms, no group meetings, increased social isolation) (Hossain et.al.,2020). Many workers were encouraged to working from home (WFH) full-time, redefining the traditional definition of WFH, which had previously only been used for specific types of work, on an as-needed basis, or in unusual employee circumstances. The abrupt shifts to WFH and other factors associated with the COVID-19 pandemic has causes changes in physical and mental well-being. Most apparent impacts on health are due to social and behavioral factors. Due to a lack of physical exercise, lack of movement, and embraced sedentary behavior, musculoskeletal disorders (MSDs) are frequent among office employees worldwide, particularly in the neck, shoulders, and lower back regions (Shariat, 2016). Those who spend the most of their working hours sitting, often due to the nature of their jobs, are the most likely to develop MSDs and be affected by them (Ricci, 2006). WFH are most likely to reduce their physical activity exposure, which may cause them to develop musculoskeletal disorders. Therefore, this study is needed to fill a research gap by determining the relationship between level of physical activity and subjective musculoskeletal pain among WFH adults.

## Methodology

This quantitative, cross-sectional study conducted among working adults that are working from home in Malaysia. The unknown sample size was estimated as  $n = 385$  using the Epi Info sample size calculator. An online questionnaire distributed via Google form links to be filled up, with details of the study such as objective, method and purpose was included in the form. Participants aged between of 18-59 and has been working from home over 6-12 months were recruited for this study. Participants that have history of fracture, current or previous musculoskeletal spine condition, current hip or knee condition, chronic respiratory condition were excluded from the

study. The participants who met the inclusion criteria with informed consent responded to the Nordic questionnaire and Baecke Physical Activity Questionnaire.

### **Nordic questionnaire**

Standardized Nordic questionnaire, first published in 1987 and initially designed for all musculoskeletal illnesses, primarily low back pain, is the most widely used symptom questionnaire. Specific sections for the lower back, neck, and shoulder regions are included in the Nordic questionnaires. For different areas of the upper limb, similar sets of questions might be added (elbow, wrist, hands) (Descatha et al., 2007). Based on the study done by (Crawford, 2007) and found out that Nordic Musculoskeletal questionnaire has the reliable, valid as a MSK pain screening tool, good tools that is repeatable, sensitive and useful.

### **Baecke Physical Activity Questionnaire**

Self-reporting questionnaire has the benefit of covering a wide variety of the individuals' physical activity during work, sport, and recreational activities as compare to others questionnaires (Baecke, 1982). Furthermore, the Baecke habitual physical activity questionnaire is well-known and regularly used to assess patients' level of physical activity in clinical and laboratory research of musculoskeletal illnesses (Sadeghisani, 2016). In the study by (Florindo & Latorre, 2003) it was found that self-report Baecke Physical Activity Questionnaire show reliability and validity in assessing the level of physical activity.

### **Statistical Analysis**

The data was analyzed using SPSS version 26 Mac OS. Participant's demographic data such as age, gender, occupation, and period of working from home were collected and analyzed using descriptive analysis to report the frequency. Baecke Physical Activity Questionnaire was used to collect data on level of physical activity and the Nordic Questionnaires was used to collect data on subjective musculoskeletal pain. A Chi-square test was used to determine the relationship between the level of physical activity and subjective musculoskeletal pain. The significant level was set as ( $p < 0.05$ ).

## **Results and Discussion**

In total, 200 participants responded but only 181 participants were involved in this study based on meeting the inclusion criteria of which females are more predominant ( $n = 96$ , 53%) with, mean ages were (29.353,  $SD = 0.638$ ) and work in professional jobs ( $n = 35$ , 19.3%). Most of the WFH adults are from Kuala Lumpur ( $n = 51$ , 28.2%). The majority of WFH adults have worked for more than a year ( $n = 122$ , 68%) and for at least 6–12 months ( $n = 58$ , 32%) as shown in Table 1.

Table 1: Demographic data from the Work from Home Adults

Variable	No (%)
Age	
18-29	120 (66.3)
30-44	47 (26.0)
45-49	14 (7.7)
Gender	
Male	85 (47)
Female	96 (53)
Occupation	
Manager	5 (2.8)
Professional	67(37)
Technicians and Associated Professionals	21 (11.6)
Clerical Support Workers	29 (16)
Services and sales worker	59 (32.6)
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### Level of Physical activity among the WFH adults

The adults at WFH had mean Work PA levels of (2.46) Sport PA (2.20), and Leisure PA of (2.37), and the total level of physical activity level of (6.756). A significant correlation ( $p = 0.014$ ) found

between the type of occupation and the Physical activity level at work index. A significant relationship found between work index and age ( $p = 0.005$ ), occupation ( $p = 0.015$ ), age and the leisure index ( $p = 0.0025$ ).

### Musculoskeletal Pain reported by WFH adult for the past 12 months

As shown in Figure 1, the three most common musculoskeletal pains reported by respondents are neck pain ( $n = 98$ , 54%), shoulder pain ( $n = 94$ , 41%), and low back pain ( $n = 76$ , 51.9%).

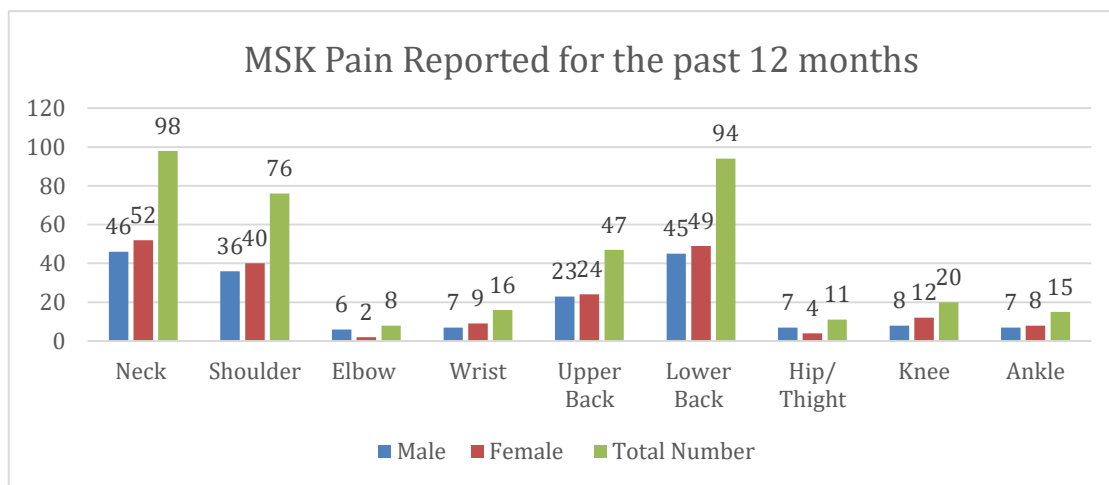


Figure 1: Frequency of the musculoskeletal pain experienced by WFH adults

### MSK pain and Level of physical activity

Significant difference found at the wrist joint at leisure index ( $p = 0.004$ ), hip and thigh joint at total physical activity index ( $p = 0.048$ ) and Ankle joint at work index ( $p = 0.006$ ), sport index ( $p = 0.023$ ), leisure index ( $p = 0.019$ ) and total physical activity index ( $p = 0.003$ ) as shown in Table 2a and Table 2b.

Reduced physical activity level and increase in sedentary behaviour due to Covid -19 regulation and social distancing as the result, forces the working adults to WFH. There is a reduction in travel time to work thus it increases the sedentary behaviour for example prolonged sitting, prolong facing the computer and prolonged usage of electronics like computer, tablet, and digital smartphone. (Moretti et al., 2020; Argus & Pääsuke, 2021). Study conducted by (Stamatakis et al., 2019) found out that increase physical activity can reduce the chance of getting cardiovascular disease. However, in comparison to the current study, we found out that most of our respondent have reduced level of physical activity especially the work PA level. This is due to the reduction in walking and standing time while working from home. In the current study we found out that Sport PA is the most impacted physical activity level among the work from home adults. A study done by McDowell et al. (2020) found out that people who losses their job during the pandemic has low to moderate leisure physical activity level. Similarly, in the current study, although the employment status is not observed, the leisure physical activity level is low among our respondents (McDowell et al., 2020). Neck pain, shoulder pain and low back pain is the most

Table 2a: Relationship between the level of physical activity & subjective musculoskeletal pain

Activity Body Area		N	Work Index		Sports Index	
			Mean (SD)	p-value	Mean (SD)	p-value
Neck	Yes	98	2.49(0.71)	<b>0.014*</b>	2.11(1.44)	0.359
	No	83	2.42(0.49)		2.30(1.37)	
Shoulder	Yes	76	2.50(0.63)	0.590	2.08(1.40)	0.923
	No	105	2.43(0.61)		2.26(1.42)	
Elbow	Yes	8	2.54(0.53)	0.705	2 (1.51)	0.969
	No	173	2.45(0.62)		2.20(1.41)	
Wrist	Yes	16	2.64(0.66)	0.447	2.156(1.25)	0.649
	No	165	2.44(0.17)		2.19(1.42)	
Upper Back	Yes	47	2.48(0.65)	0.365	2.19(1.41)	0.249
	No	134	2.45(0.61)		2.20(1.41)	
Lower Back	Yes	94	2.42(0.63)	0.207	2.05(1.42)	0.079
	No	87	2.49(0.60)		2.35(1.37)	
Hip/ Thigh	Yes	11	2.46(0.76)	<b>0.004*</b>	3 (0.51)	0.370
	No	170	2.46(0.61)		2.14(1.43)	
Knee	Yes	20	2.53(0.62)	0.800	2.41(1.25)	0.326
	No	161	2.45(0.62)		2.17(1.43)	
Ankle	Yes	15	3.09(0.89)	<b>0.003*</b>	2.98(1.36)	<b>0.024*</b>
	No	166	2.40(0.55)		2.129(1.39)	

\*Significant value (p <0.05), Chi-Square test

Table 2b: Relationship between the level of physical activity & subjective musculoskeletal pain

Activity Body Area		N	Leisure Index		Total Physical Activity	
			Mean (SD)	p-value	Mean (SD)	p-value
Neck	Yes	98	2.34 (0.69)	0.851	6.61(1.90)	0.182
	No	83	2.41(0.59)		6.91(1.75)	
Shoulder	Yes	76	2.34 (0.59)	0.938	6.56(1.53)	0.365
	No	105	2.39(0.68)		6.86(2.01)	
Elbow	Yes	8	2.65(0.73)	0.098	2.54(1.20)	0.999
	No	173	2.36(0.64)		2.457(1.85)	
Wrist	Yes	16	2.82(0.62)	<b>0.002*</b>	6.96(1.39)	0.559
	No	165	2.329(0.63)		6.71(1.87)	
Upper Back	Yes	47	2.28(0.55)	0.883	6.76 (1.81)	0.455
	No	134	2.41(0.67)		6.75(1.85)	
Lower Back	Yes	94	2.30(0.66)	0.084	6.58(1.77)	0.211
	No	87	2.46(0.62)		6.93(1.89)	
Hip/ Thigh	Yes	11	2.68(0.43)	0.488	7.78(1.94)	0.068
	No	170	2.35(0.65)		6.68(1.81)	
Knee	Yes	20	2.58(0.74)	0.361	7.018(1.60)	0.800
	No	161	2.35(0.63)		6.72(1.86)	
Ankle	Yes	15	2.766(0.57)	0.365	8.25(2.00)	0.115
	No	166	2.34(0.64)		6.62(1.76)	

\*Significant value (p <0.05), Chi-Square test

reported pain by the respondent in the current study. Based on the study done by (Shah & Desai, 2021), they also found out that neck and upper/lower back pain are common MSDs while using the computer. Another study done by (Iqbal & Dar, 2020) found out that, the reasons of low back pain might due to prolonged sitting on the chair/ bed, in a non-ergonomic way and with in-proper posture. Studies done by (Radulović et al., 2021; Smith et al., 2019; Anand & Goyal, 2020) also found out that the respondents were all having similar characteristic of prolonged usages of electronic device, Poor ergonomic design, prolonged sitting and working thus causing the MSK pain.

We found that studies conducted by (Hanna et al., 2019; Hartvigsen et al., 2018; Bontrup et al., 2019; Chen et al., 2020) where overall decrease level physical activity is due the covid 19 regulations, forced to stay at home, and WFH. This has resulted increase in sedentary behaviour such as prolonged sitting, prolonged usage of the computer, and staying at home for a prolonged period of time. Increase in sedentary lifestyle and sedentary behaviour causes musculoskeletal pain. Since the participants were reached through online Google Forms, only 200 participants responded, and the study does not meet the estimated sample size of 385, which may affect the findings of this study.

### **Conclusion**

This research showed that working from home (WFH) does decrease the level of participants' physical activity, hence leading to an increase in neck, shoulder, and low back pain when compared with other body regions. The study results emphasize that reduced physical activity affects musculoskeletal functions while working over a period of time in WFH, which may produce pain or discomfort. Future studies need to focus on the correlation between BMI and duration of working hours, which may influence the study findings.

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### **Conflict of interest:**

The author(s) declare(s) that there is no conflict of interest.

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