

## PREVALENCE RATE OF MUSCULOSKELETAL DISCOMFORTS BASED ON SEVERITY LEVEL AMONG OFFICE WORKERS

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**Summary.** There are a variety of body aches that fall under the umbrella term of Musculoskeletal Discomforts (MSDs). These can be distinguished based on the level of pain suffered by the patient, ranging from mild and sporadic to serious, constant and fatal. It has been suggested that a link exists between MSDs and risk factors involving one's occupational conditions and physicality. Examining the prevalence rate of musculoskeletal discomforts based on the severity among office workers was the main objective of this study. In order to achieve this objective, we had, in February 2015, selected from a population of 20 000 Malaysian office workers, 753 subjects within the age range of 20-50 years who have had a minimum of a year's working experience. For this study, a form of structured questionnaire, known as the Cornell questionnaire, has been evaluated and put to use. Under the watch of the researchers, the subjects were instructed to complete the questionnaire in the morning before they begin their respective jobs. Based on their responses, the Cornell questionnaire has revealed that at least one case of severe pain in the neck, shoulder or lower back, respectively, is suffered by 69.7% of the subjects. In the case of neck-related aches, 15% low pain, whereas 51% involved mild pain and 33.9% were cases of severe pain. That being said, 19.3% low pain in the lower back, while 50.7% suffered from mild pain and 30% had severe pain in the same region. Percentages of 34.9% for high severity, 45.4% for mild severity and 19.7% for low severity were simultaneously reported in the shoulder section. In a nutshell, the study has

revealed that, in comparison with body aches in the arms, knees, upper back, forearms, wrists, hands, hips and thighs, the subjects are more vulnerable to body aches in the neck, shoulders and lower back.

**Key words:** *prevalence, musculoskeletal discomforts; office workers; Cornell questionnaire*

## INTRODUCTION

Identified in the early 1970's as a significant factor behind work-related impediments, Musculoskeletal Discomforts (MSDs) were initially categorized as "occupational cramps" or "occupational myalgia", in addition to being linked to a range of jobs and other work-related activities [1, 2]. There has been, however, a considerable shift in recent decades surrounding the daily activities of the average office worker, thanks to significant advances in information technology. That being said, the number of office workers in Western countries who use their personal computers while working are estimated to exceed half of the total population [3]. This has, over the years, subsequently led to a significant rise in the amount of time spent in using a computer and mouse. It has been hypothesized that such changes are somewhat responsible for the rise in MSDs. As a term used to describe "musculoskeletal discomforts of arm, neck, shoulder, knee, wrist, forearm, lower back and upper back not caused by acute trauma or by any systemic disease" [4, 5], MSDs were first coined in the Netherlands and were known to result in serious and occasionally fatal warning signs, including pain, numbness and tingling. That being said, MSDs can also lead to such external effects as raises in workers' financial compensations, declines in work-related productivity and poor performances in job-related assignments [6, 7]. According to the American Bureau of Labor Statistics, a link to MSDs can be traced in nearly two-thirds of recently-recorded cases in the USA that involve various impediments in the workplace [8, 9]. On the other hand, there is much that has yet to be discovered for now, as the link that connects MSDs with workplace-related risk factors is still vague at best. Hence, it is crucial to distinguish the risk factors that contribute to the prevalence of MSDs, as it helps to not only identify those who are particularly susceptible to MSDs, but also to design methods that can successfully diagnose and curb MSDs in future, before MSDs themselves evolve into crippling ailments. As such, where this study is concerned, it is thus fitting to first devise and sophisticate instruments for measurement in highlighting MSDs risk factors by narrowing the scope of the selected case population to office workers whose respective jobs involve computers. Admittedly, academic scholarship on such instruments for measurement has been conducted quite extensively in the past [10,11]. However, there remains a gap in the form of assessing MSDs with a questionnaire that is simple but encompassing by nature. That being said, a number of components that determine the prevalence of MSDs in the Cornell questionnaire, which were previously employed in previous studies that focus on

identifying MSD risk factors, have been selected [12,13]. The main aim of this study was to determine the prevalence rate of musculoskeletal discomforts based on the severity among office workers. Thus, a population of Malaysian office workers has been selected to fulfill that aim.

## MATERIAL AND METHODS

### ***Subjects***

Participation in this study is limited to office workers within the age limit of 20 to 50 years who have had at least a year's experience of working with the use of a computer, out of which 753 have been selected. When the study was commenced in February 2015, the subjects were randomly selected from a population of 20,000 active Malaysian office workers from various areas. In ensuring that the subjects are given ethical treatment, the steps taken to conduct this study have been carried out in tandem with the Helsinki Declaration [14]. Ethical approval for the study was obtained from Department of Occupational Health, University Putra Malaysia.

### ***Data collection***

This procedure was carried out early in the morning, before the subjects began work at their respective workplaces. Under the supervision of the researchers, the subjects were instructed to fill the questionnaire after being briefed by the researchers, section by section, on its components.

### ***Questionnaire***

The International Musculoskeletal Discomfort (MSD) Questionnaire, now regarded as one of the key components in academic scholarship on musculoskeletal disorders, was devised in the late 1990s by Dr Alan Hedge of Cornell University and a group of graduate students from the field of ergonomics [15]. Admittedly, prior to the conception of the Cornell Questionnaire (CMDQ), several questionnaires emphasizing on posture have already been developed and put into practice. However, the CMDQ stands out from these other questionnaires in a sense that it not only evaluates levels of discomfort based on seriousness and occurrence, but also the extent to which MSDs can negatively affect one's job performance. In this study, three questions, namely (1) "How often did you encounter aches, pain and/or discomfort when you were last at work?", (2) "How uncomfortable were you when you encountered such aches, pain and/or discomfort?", and (3) "If you have experienced these aches, pain and/or discomfort, did you also experience any form of interference in your work?", have been reiterated in each section of the questionnaire, which were in turn given such labels as Neck, Shoulders, Upper Back, Upper Arms, Lower Back, Forearms, Wrists, Hips, Thighs, Knees, Right Lower Leg and Left Lower Leg [16].

### ***Calculation of MSDs prevalence rate***

As opposed to diagnostic purposes, research screening purposes are instead the reasons as to why this questionnaire was put into practice. With reference to the

steps below, analysis of the obtained scores were carried out as follows: never = 0; 1-2 times/week =1.5; 3-4 times/week =3.5; once a day= 5; several times a day=10.

The results of the questionnaire are determined by way of multiplying both the scores for levels of discomfort (1-3) and interference (1-3) with the frequency scores stated above (0-10).

“0” is used in classifying missing values that have been detected whilst computing the analysis. As such, the combined score of frequency, discomfort and interference is reduced to zero if the frequency score sports a missing value. This, on the other hand, does not apply if the missing value is detected in either the discomfort or interference scores [15].

The discomfort score helps to determine the level of seriousness in discomfort, ranging from mild and moderate to severe.

The SPSS 21.0 software package has been used as a platform to conduct all forms of statistical analyses, whereas the frequency score has been examined with the application of descriptive analysis.

### ***Validity of questionnaire***

Validity tests are required due to the translation of the questionnaire from English to Malay for the benefit of the subjects [16].

#### ***Content validity***

3 experts with PhD PT qualifications, of whom 2 are from Iran and 1 is from Sharjah, have facilitated this study. An occupational health specialist and company doctor equipped with the knowledge and past experience on the field of study, along with a group of professional translators, have also been enlisted to form a committee. The task of this committee is to review both the original copy and translated drafts of the questionnaire[16].

#### ***Concurrent validity***

The Visual Analog Scale (VAS) helps determine the concurrent validity of the study. Hence, it is expected that subjects who reported pain or discomfort in the CMDQ-M have also done so in the VAS. Similarly, subjects who reported “Never” in the CMDQ-M are also bound have made the same response in the VAS [16].

#### ***Face validity***

For face validity, the respondents were subjected to interviews. In this context, respondents who had expressed problems in comprehending or filling the questionnaire were given an alternative version of the CMDQ-M, in which they were interviewed by the researchers instead [16].

#### ***Reliability***

Participants are required to fill the questionnaire twice as part of a strategy to assess the CMDQ-M’s internal uniformity and stability. As in the case of previous researches, there is also an intermission lasting between seven to ten days in between the running of tests. To evaluate the reliability of the test, the researchers

have used the Kappa coefficient, in addition to an evaluation each for the assessment of interference, severity and frequency. The method of factor analysis was then utilized to evaluate construct validity. As for the measuring of internal consistency, the researchers have relied on Cronbach's alpha statistic with a recommended value of  $\alpha \geq 0.70$  [16].

## RESULTS

### ***Demographics***

All participants of the study were Malaysian citizens within the age range of 20 to 50 years, out of which women formed the majority, constituting 65.1% of the total respondent population. In addition, a minimum of a year's working experience in an office was another common characteristic shared by all participants, who all have similar jobs too. 753 participants have filled the questionnaire, of which 489 (65.1%) were women and 263 (34.9%) are men. No out-of-range cases have been reported in the data screening stage, and no systematic pattern was detected either, as all occurrences of missing values were far-flung and minimal, numbering at just below 2% in total. That being said, the researchers did not take into consideration the missing values detected in the study. An examination on the skewness and kurtosis of the domains was simultaneously carried out to determine the nature of distribution of scores on the domains. As such, no significant divergence from any of the main domains' routine characteristics has been detected based on the results.

### ***Validity***

#### ***Content validity***

Based on the opinion of the experts, the back translation in all items was very strongly (90%+) matching the original English version of the CMDQ [16].

#### ***Concurrent validity***

The associations observed between the CMDQ-M and VAS-M for overall, severe, moderate, and mild pain were moderate ones ( $r_s = .309-.466$ ,  $P < .01$ ) [16].

#### ***Face validity***

All the other the participants commented positively on the statements orderly arrangement, clarity, representation of MSD prevalence and simplicity, confirming the high degree of face validity [16].

### ***Reliability***

During 2 weeks of testing and retesting for reliability, the researchers have found that in frequency, the range based on Kappa coefficients was between 0.690 and 0.949, whereas the range of 0.801-0.979 was reported in severity, and interference sported a range of 0.778-0.944 [16].

**Prevalence rate and severity of MSDS**

Based on data collected from the questionnaire, one high severity score in the neck, shoulders and/or lower back was reported by 69.7% of the subjects, whereas one high severity score in the arms, knees, upper back, forearms, wrists, hands, hips and thighs clocked in at 11% (Table 1). In the neck section, 33.9% reported high severity, 51% reported mild severity and 15% reported low severity (Table 2). Percentages of 34.9% for high severity, 45.4% for mild severity and 19.7% for low severity were simultaneously reported in the shoulder section (Table 3). Finally, 30% reported high severity in the lower back section, followed by 50.7% for mild severity and 19.3% for low severity (Table 4).

**Table 1.** Prevalence rate of musculoskeletal discomforts based on the severity

	Severity		
	Low (%)	Mild (%)	Severe (%)
Neck	15.0	51.1	33.9
Shoulder-right	19.7	45.4	34.9
Shoulder-left	20.5	45.3	34.3
Upper back	78.0	13.3	8.8
Upper arm-right	89.4	8.0	2.7
Upper arm-left	86.7	9.8	3.5
Lower back	19.3	50.7	30.0
Forearm- right	96.0	2.9	1.1
Forearm-left	96.1	2.8	1.1
Wrist-right	87.8	9.3	2.9
Wrist-left	86.6	10.2	3.2
Hip buttocks	88.6	9.3	2.1
Thigh-right	98.3	1.6	0.1
Thigh-left	97.3	2.4	0.3
Knee-right	86.6	10.9	2.5
Knee-left	85.9	11.6	2.5
Lower leg-right	93.8	4.9	1.3
Lower leg-left	94.2	4.4	1.5

**Table 2.** Prevalence rate of Neck discomforts based on the severity

Severity	Frequency (N)	Frequency (%)
Low	113	15.0
Mild	385	51.1
Severe	255	33.9
Total	753	100.0

**Table 3.** Prevalence rate of Shoulder discomforts based on the severity

Severity	Frequency (N)	Frequency (%)
Low	148	19.7
Mild	342	45.4
Severe	263	34.9
Total	753	100.0

**Table 4.** Prevalence rate of Lower back discomforts based on the severity

Severity	Frequency (N)	Frequency (%)
Low	145	19.3
Mild	382	50.7
Severe	226	30.0
Total	753	100.0

## DISCUSSION

Evaluating the prevalence rate of musculoskeletal discomforts based on the severity among a population of Malaysian office workers whose jobs involved tasks carried out with the use of computers, as well as examining the Cornell questionnaire, a recently-devised, comprehensive questionnaire containing components in which links to a rise in MSDs have been found, were carried out through the current sample population of 753 Malaysian office workers. Subsequently, a higher occurrence of pain in the neck, lower back and shoulders, as opposed to pain in the arms, elbows and hands, have been found in the results of the study.

On the other hand, the link between computer use and pain in the hands and arms, as opposed to the link between computer use and pain in the neck and shoulders have been focused on more extensively in past academic scholarship, thereby making the findings of this study somewhat contentious [3, 17]. There is, nevertheless, academic scholarship that also suggests a higher occurrence of pain in the neck and/or shoulders among office workers whose jobs involve computers [18, 19]. Specifically, it has been argued that pain in the neck is a result of such job-related problems as exacting demands, minimal hours of rest and unhealthy working conditions [20, 21]. As such, it should be noted with care that certain contributing factors that are absent in cases of pain in the hands and wrists can instead be found in cases of pain in the neck and shoulders. Nevertheless, it is the examination of the range of warning signs in terms of intensity and/or frequency, as well as the confusion created by a generalized conceptualization of body regions in the process of comparing results effectively, that can be found in much of the existing academic scholarship [2, 7]. On the other hand, different manuscripts are allotted to aid in the examination of the link between MSDs and risk factor scales.

It has been revealed, nonetheless, that women are more prone to experiencing musculoskeletal discomforts in the neck and shoulders, as opposed to men, despite the fact that they share similar working environments and experiences. This has been somewhat iterated in another study [22], in which women (72%) were found to be more susceptible, annually, to pain in the neck and upper body regions, in comparison with men (51%). Such a difference along the lines of gender can be attributed to the fact that when the execution of tasks comes into question, men's physical needs and/or work organization are different from those of women's. An argument has also been put forward by the European Foundation for the Improvement of Living and Working Conditions, in which men are less inclined to sit at work for long stretches of time compared to women, whose tasks are often repetitive by nature, on average. That being said, chores associated with and traditionally done by women, such as housekeeping and childcare, are possible contributing factors as well [23, 24].

Based on results from the Cornell questionnaire, the Cronbach's alpha coefficients that were put to use in the majority of the questionnaire subscales exceeded the aforementioned minimum of 0.70. A rather unsatisfactory item-total link, either under 0.2 or above 0.5, has been detected in several components related to scales that evaluate social support and work station. Despite the removal of certain components to balance out the elimination of several items from the scale, there has been minimal improvement in Cronbach's alpha. Given that the gulf in the definitions of certain scale components is too wide for them to be categorized in the same scale, the enumeration of internal consistency in work environment quality was not carried out by the researchers.

## CONCLUSION

The prevalence of pain in the neck, lower back and shoulders have been reported to be higher in comparison with pain in other parts of the upper body. That being said, a higher prevalence of upper extremity musculoskeletal discomforts can be found in women as opposed to men. The reliability and internal consistency of the Cornell questionnaire, which was selected for this study, has proven satisfactory in documenting the prevalence of MSDs among Malaysian office workers. A future research in which worker groups can be identified based on a more encompassing ergonomics-based analysis can also utilize this questionnaire as screening inventory for occupational health services.

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