ORIGINAL ARTICLE

Work-related musculoskeletal disorders and its association with physical fitness among physiotherapy students attending public universities in Malaysia

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Abstract:

Physical fitness plays a key role in minimizing work-related musculoskeletal disorders (WRMSDs) among physiotherapists. A cross-sectional study was undertaken to determine the prevalence of WRMSDs and their associated factors among physiotherapy students in public universities in Malaysia. A self-administered questionnaire (Standardized Nordic Questionnaire) was distributed and physical fitness level was assessed on 114 undergraduate physiotherapy students from the only three public universities in Malaysia offering Physiotherapy program. Physical fitness assessments consisted of body composition, muscle flexibility, muscle strength and cardiorespiratory endurance tests. The overall prevalence of WRMSDs among physiotherapy students was 82% with more female reported having WRMSDs when compared to males students (84% vs. 73%, $p < 0.000$). The lower back was reported as the body area most affected by WRMSDs within the past 12-months and 7 days (31% and 24%, respectively) followed by neck (16% and 10%, respectively) and shoulder (11% and 7%, respectively). Significant differences were observed between the proportion of students who had undergone clinical placement between 10-15, 16-20, and 21-25 weeks ($\chi^2 = 8.80$ $p = 0.003$) on WRMSDs. However, no significant differences were observed on the prevalence of WRMSDs across BMI and level of physical fitness. In summary, the prevalence of WRMSDs among physiotherapy students in Malaysia is high and physical fitness are not associated with WRMSD.

Keywords: physical fitness, physiotherapy students, work-related musculoskeletal disorders

1. INTRODUCTION

Physical fitness endures a key fulfillment for a better health in all population despite its assessment could be interfered by various factors. Physical fitness can be described as an individual capacity to perform activities of daily living vigorously and manifest a person characteristic and ability that are related to low risk of disease development that can be due to sedentary lifestyle [1]. There are four main components that determine fitness; (i) body composition, (ii) cardiorespiratory endurance, (iii) muscular strength, and (iv) flexibility [2]. Limitation in either of these four physical fitness components could expose an individual to injury at workplace or also known as work-related musculoskeletal disorder (WRMSD) has never been studied.

The profession of physiotherapy (PT) requires a reasonably high level of physical fitness in order to provide a good quality of services to their patients and client since their job scope are varied [3-4]. The nature of their work requires them to perform the same task over and over again, maintain in the same position for a long period and carry task that give pressure to the spine such as lifting and transferring patients [5]. The consequences of low level of physical fitness during their practice results in overstraining of body structures and could be one of the reasons for developing WRMSDs [3].

The high incidence of WRMSD among physiotherapist had been widely reported in the previous studies [6-8] as well as the incidence of lower back pain among undergraduate students [9-11]. As high as 91% or 1 in 6 physiotherapists moved within or left the profession as a result of WRMSDs [12]. With regards to the body area, previous studies reported that lower back was the most common site of complaint by physiotherapists followed by neck, upper region and wrist/hand [12-14].

Data reporting WRMSDs among physiotherapy students are limited. A prevalence study on low back pain (LBP) among physiotherapy undergraduate students in an Australian University, revealed that the risk of LBP increased significantly with the duration of study [10]. Specifically, among the 250 students responded to their survey, as high as 69% students reported injuries at the lower back during the course with 28% reported having it within one-week, 44% within a month and 63% within one-year enrollment into the

program. The occurrences of WRMSDs could be influenced by several factors including gender, body mass index (BMI) and the period of working hours. For instance, the prevalence of WRMSDs was reported to be higher in females than males [13-15] and in obese individuals than in individuals with normal BMI (i.e. 20% in BMI 18-25kg/m^2 vs. 80% in BMI >25kg/m^2) [16]. It is essential for physiotherapist to maintain their body weight in order to keep a good appearance since they serves as a role models and also a motivator to their patients in exercise adherence and compliance [17]. However, it is still unclear whether WRMSDs are one of the repercussions by having low physical fitness or can be caused by some other factors. Therefore, the purpose of this study is to determine the prevalence of WRMSDs, body area that the most affected by WRMSDs and their associated factors such as gender, BMI, period of clinical placement and physical fitness among physiotherapy students in public universities in Malaysia.

2. MATERIALS AND METHODS

A cross-sectional study design was conducted among physiotherapy students from April 2018 untill May 2019. This study recruited a stratified random sampling from three public universities offering Physiotherapy program in Malaysia (i.e. Universiti Teknologi MARA (UiTM), Puncak Alam, Universiti Kebangsaan Malaysia (UKM), Bangi and Universiti Islam Antarabangsa (UIA), Kuantan. The protocol of the study was approved by the Human Research Ethics Committees of UiTM (REC/230/16).

The students free schedule was identified and an appointment was made with the class representative prior to the actual assessment day. The students were (i) alerted to take their last meal at least two hours before undertaking the physical assessments, (ii) instructed to wear suitable clothing and (iii) required to complete a consent form approved by the ethical committees prior to the testing session. Inclusion criteria included (i) age ranges from 19-28 years old and (ii) PT bachelor degree students of UiTM, UKM and UIA who hade undergone clinical training. Exclusion criteria for this study were any PT degree student from UiTM, UKM and UIA who suffered from any physical or medical problems that could potentially affect physical fitness assessments (e.g. cardiopulmonary disorder such as asthma, endocrine disorder such as hypertension or diabetes mellitus and etc.).

A self-administered questionnaire (Standardized Nordic Questionnaire) was distributed to 114 participants. The questionnaire consists of three main sections that include (i) demographics information, (ii) symptoms and area of pain and (iii) job risk factors. The first section consists of demographic information such as age, sex, semester and the period of clinical placement. The second section has nine anatomical regions (i.e. neck, shoulder, elbow, wrist and hand, upper back, lower back, hip, knee and ankle) where respondents were asked to choose the most painful body region (only one) they experienced from the last 7 days and 12 months that interfere with their job. The third section comprises 17 job risk questions that could lead to injuries.

Assessment of physical fitness comprises of body composition, cardiorespiratory endurance, muscular strength and flexibility.

In the present study, BMI was used as an indicator of body composition and was measured by using Tanita Body Composition Monitor, model BC730 (Tanita Corporation, Tokyo, Japan) [3]. The Body Mass Index (BMI) was based on the WHO (2000) classification [18] for underweight (<18.5kg/m^2), normal weight (18.5 kg/m^2 – 24.9 kg/m^2) and obesity (>25 kg/m^2). Muscle strength was tested by using 90-degree push up test while the strength of the trunk muscles was tested by using curl-up test.The 90º push-up has shown a higher correlation (r = 0.99) with bench press in order to measure upper limb muscular strength and endurance [19] and curl-up test was mostly used in the previous published articles in assessing abdominal muscular strength and endurance [2,21-22]. The flexibility of the upper limb was tested by using shoulder stretch test while the flexibility of the lower limb was tested by using back saver sit and reach test [4]. Muscle strength and flexibility assessment were conducted and scored based on FITNESSGRAM standards. Cardiorespiratory endurance was tested by using a 3-minute step test [22]. 3-minute step test bring an effective method in assessing maximal oxygen uptake (VO_2max) and can be performed in variety of setting [23] with strong correlation (r = 0.75) [24]. The classification of cardiorespiratory endurance was rated based on guidelines published by YMCA (2008) [25].

Statistical Package for Social Sciences (SPSS) software version 24.0 was used to analyze the data. Descriptive data was reported as mean and standard deviation (SD) with p value <0.05. The differences in responses between the subgroups of interest such as gender, body mass index (BMI), period of clinical placement and physical fitness were compared by using the chi-square test.

3. RESULTS AND DISCUSSION

Table 1 shows the characteristics of the study participants.

Table 1: Participants' characteristics (N=114)

Variable	Mean ± (SD)	N (%)
Age (years)	23.4 ± 0.9	
Weight (kg)	63.1 ± 40.7	
Height (m)	158.1 ± 7.0	
BMI (kg/m²)	25.1 ± 16.6	
Gender		
Male		15(13)
Female		99(87)
BMI (kg/m²)		
<18		8(7)
18-25		70(61)
>25		36(32)
Period of Clinical placement		
10 - 15 weeks		13(11)
16 - 20 weeks		47(41)
21 - 25 weeks		54(47)

Data are presented as mean ± standard deviation (SD) and frequency and percentage n (%)
Abbreviation: BMI, body mass index.

3.1 WRMSDs among PT students

The prevalence of WRMSDs among the participants and according to the subgroups of gender, BMI, and period of the clinical placement are shown in Table 2. The overall prevalence of the WRMSD among the three public

universities was 83%. Female students reported a significantly higher prevalence of WRMSD than male students (84% vs 73%; p<0.001). With regards to BMI, majority of the students with WRMSD were from normal BMI (61%). Significant differences were observed between the proportion of students who had undergone clinical placement between 10-15, 16-20, and 21-25 weeks (p= 0.003). These results are consistent with other studies that investigated the prevalence of WRMSD among working physiotherapists [7,16,26]

As a physiotherapy students, given the fact that they had to spend many hours on practical classes that also include manual lifting and transferring (~1280 hours/course) [27], they are seen to expose to about similar clinical load as working physiotherapist and consequently WRMSDs. This could therefore justify the finding from earlier study where the incidence of WRMSDs appear to develop since undergraduate training [28].

In the present study, more females than males reported having WRMSDs (84% vs. 73%, p <0.000). This could be explained by the fact that women muscle mass was 36% lower than men [29] and thus may lead to them being physically weaker and face greater challenges in physically demanding tasks when compared to men. The period of clinical placement is one of the predisposing factors that related to WRMSDs in the present study. As high as 54% of physiotherapy students reported with WRMSDs have attended clinical placement for 22 to 25 weeks. This could be explained that PT students spent the equal time treating patients (8 hours) as qualified physiotherapist during their clinical training [16]. The clinical workload and the average time spent during clinical placement were the important key that contributed to 1-year WRMSD [30].

Table 2: Distribution of WRMSDs (N=114)

WRMSDs	Yes	No	p-value[a]
Overall respondents	94 (82)	20(18)	
Gender			
Male	11(73)	4(27)	
Female	83(84)	16(16)	<0.001
BMI (kg/m²)			
<18	5(5)	3(15)	
18-25	57(61)	13(65)	
>25	32(34)	4(20)	0.194
Period of Clinical Placement			
10 – 15 weeks	9(10)	4(20)	
16 – 20 weeks	34(36)	13(65)	
21 – 25 weeks	51(54)	3(15)	0.003

[a]Chi-square test. Data are presented as frequency and percentage n (%). Abbreviation: BMI, body mass index

3.2 Area of body affected by WRMSDs

The body area most affected by WRMSDs within 12 months and 7 days was found in lower back (31% and 24% respectively) (Figure 1). The elbow, hand-wrist, hip and knee were rarely affected by WRMSDs. This finding is consistent with previous studies where the prevalence of lower back area with WRMSDs ranged from 26 % to 69%. Given that undergraduate students are also exposed to working physiotherapist activities (e.g. manual techniques, repetitive task, prolonged standing, lifting and transferring patients) during clinical training, the risk of developing lower back pain increases with the increase in the duration of clinical placement.

Apart from that, prolonged sitting more than four hours has been identified as a risk factor for LBP [31] and students commonly sit for long hours a day either attending classes or finishing assignment at home throughout their three or four years of study course. Prolonged sitting causes an increase in spinal compression load [32] and constrained the paravertebral muscles [33]. This lead to tissue microdamage and paraspinal muscle dysfunction and consequently LBP [34].

3.3 Association between the level of the physical fitness and WRMSD

There is no association between physical fitness and WRMSD among physiotherapy students attending public universities in Malaysia (Table 3).

Table 3: Association between level of physical fitness and WRMSD (N=114)

WRMSD	Yes	No	p-value[a]
Body composition			
BMI			
<18	5(5)	3(15)	
18-25	57(61)	13(65)	
>25	32(34)	4(20)	0.194
Flexibility			
Back scratch test			
Right			
Good flexibility	91(97)	18(19)	
Poor flexibility	3(3)	2(1)	0.177
Left			
Good flexibility	68(72)	5(5)	
Poor flexibility	26(26)	15(15)	0.808
Sit and reach test			
Right			
Good flexibility	(32)	9(45)	
Poor flexibility	64(68)	11(13)	0.263
Left			
Good flexibility	33(35)	8(40)	
Poor flexibility	61(65)	12(60)	0.679
Muscle strength			
Curl up			
Good strength	13(14)	4(20)	
Poor strength	81(86)	16(80)	0.482
90° Push up			
Good strength	63(67)	15(75)	
Poor strength	31(33)	5(25)	0.486
Cardiorespiratory endurance			
Below average	50(53)	10(50)	
Average	18(19)	2(10)	
Above average	26(28)	8(40)	0.436

[a]Chi-square test. Data are presented as frequency and percentage n (%). Abbreviation: WRMSDs, work-related musculoskeletal disorders.

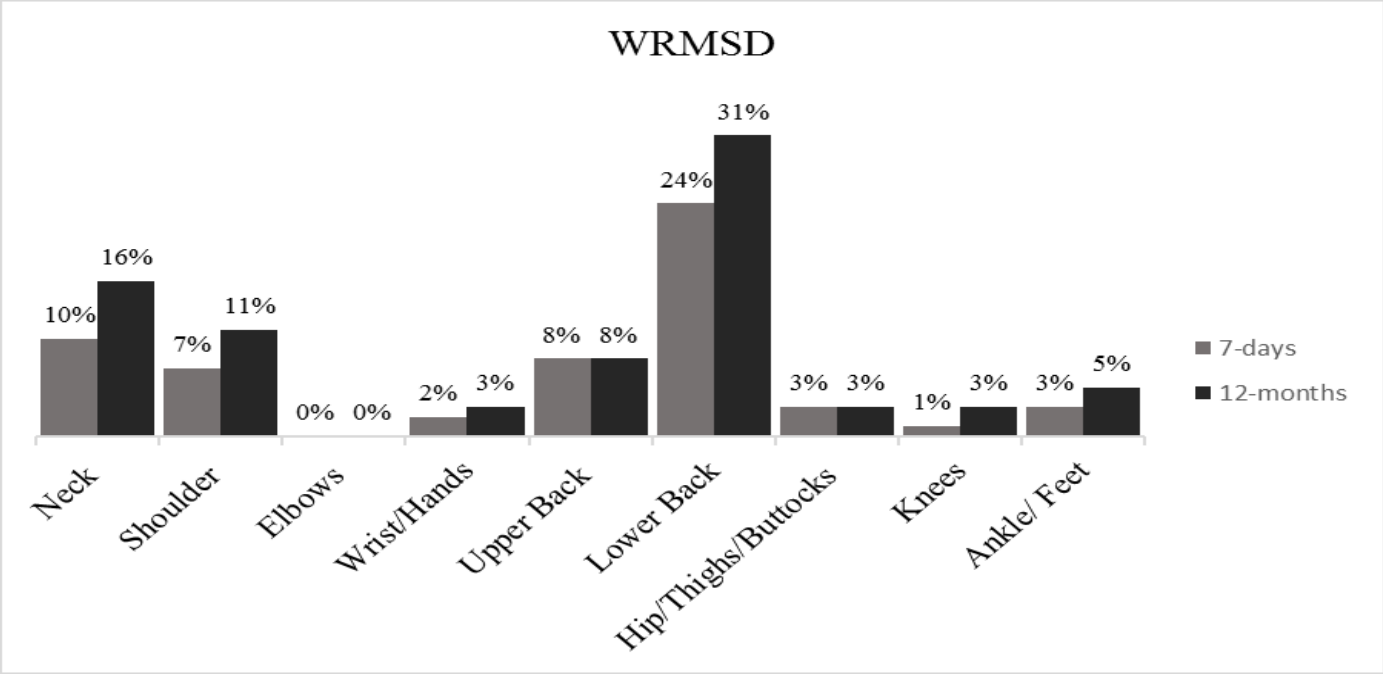

Figure 1: WRMSDs based on the region of the body (%)

The association between level of physical fitness and WRMSDs was found to be inconsistent with the previous studies [10,17,35-36]. In the present study, physical fitness is not one of the major contributor to the occurrence of WRMSD. This could be due to in young adults, in this instance the students, some of other factors such as sport involvement, physical activity level and psychological stress could have some influence on their fitness level rather than one-off physical assessment. Further studies may extend the finding of this study by including several other measures that could influence physical fitness in young adults and calculate the proportion each of these measures that may explain WRMSDs in this population.

4. CONCLUSION

The Work-related Musculoskeletal Disorders (WRMSDs) is a major concern in physiotherapy profession. It can affect either students or physiotherapists because of the nature of activities or work. Lower back area was the commonest body region with WRMSD. Female students reported a higher prevalence of WRMSDs compared to male. Factors such as physical activities, sports involvement and clinical training workload should also be considered as possible causes rather than BMI and physical fitness alone. Students need to practice the injury prevention strategies and follow the injury prevention guideline in order to minimize the chances of getting WRMSDs in the future.

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