Pervasiveness of orthopedic disorders among office and manual workers: a comparative study

Prevalencia de trastornos ortopédicos entre trabajadores de oficina y manuales: un estudio comparativo

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Received: 13-11-25
Accepted: 24-12-25

How to cite in APA

E. M. Abd El Hay, A., Zidan, M. S., Atia, D. T., Elsayed, N., Swar, W., Fergany, L., Ghattas, E. M., & Mousa, M. (2026). Pervasiveness of orthopedic disorders among office and manual workers: a comparative study. *Retos, 75*, 835-858. https://doi.org/10.47197/retos.v75.118105

Abstract

Background: Employees and Manual Workers often complain from awkward postures daily with exhausting way due to the lake of employees especially in Governmental universities.
Objective: To study the relationship between MSDs and work-related postures of physiotherapists staff and Manual Workers Employees in physical therapy Faculty of Suez University, Egypt.
Methods: Nordic Musculoskeletal Questionnaire (NMQ) was used to survey the physical therapists' musculoskeletal disorders, also Ovako Working Posture Assessment System (OWAS) was applied to evaluate, analyze and categorize the repeated work postures in 100 physiotherapists staff and Manual Workers. OWAS method was processed using WinOWAS software, involving 16 work postures. The collected data statistically analyzed using Excel and SPSS.
Results: NMQ indicated that 61% and 79 of physiotherapists staff and Manual Workers Employees, respectively reported MSDs in at least in one of the body parts during last year. The most common orthopedic disorders were lower back pain (73%), neck (69%) and shoulder pain (60%). Results of OWAS classified 7 postures (44%) in category 1 with 64 frequencies, 6 postures (38%) categorized 2 with 30 frequencies and 3 postures (19%) categorized 3 with 6 frequencies.
Conclusion: The major pervasiveness pains were in the lower back among physiotherapists staff and neck among Manual Workers Employees. OWAS work posture 4222 (category 3) were significantly associated with lower back MSDs and partially correlated with neck MSDs. Also, work posture 2221 and 2222 (category 2) were significantly correlated with lower back and neck MSDs.

Keywords

Musculoskeletal disorders, WinOWAS, nordic questionnaire, desk-based employees.

Resumen

Antecedentes: Los empleados y trabajadores manuales suelen quejarse a diario de posturas incómodas y agotadoras debido a la escasez de personal, especialmente en universidades públicas.
Objetivo: Estudiar la relación entre los trastornos musculoesqueléticos (TME) y las posturas laborales del personal de fisioterapia y los trabajadores manuales de la Facultad de Fisioterapia de la Universidad de Suez, Egipto.
Métodos: Se utilizó el Cuestionario Nórdico de Trastornos Musculoesqueléticos (NMQ) para evaluar los trastornos musculoesqueléticos del personal de fisioterapia. Asimismo, se aplicó el Sistema de Evaluación de Posturas de Trabajo de Ovako (OWAS) para evaluar, analizar y categorizar las posturas laborales repetitivas en 100 personas, entre personal de fisioterapia y trabajadores manuales. El método OWAS se procesó con el software WinOWAS e incluyó 16 posturas laborales. Los datos recopilados se analizaron estadísticamente con Excel y SPSS.
Resultados: El NMQ indicó que el 61 % del personal de fisioterapia y el 79 % del personal de trabajadores manuales presentaron TME en al menos una parte del cuerpo durante el último año. Los trastornos ortopédicos más comunes fueron el dolor lumbar (73%), cervical (69%) y de hombro (60%). Los resultados del OWAS clasificaron 7 posturas (44%) en la categoría 1 con 64 frecuencias, 6 posturas (38%) en la categoría 2 con 30 frecuencias y 3 posturas (19%) en la categoría 3 con 6 frecuencias.
Conclusión: Los dolores más frecuentes se localizaron en la zona lumbar entre el personal de fisioterapia y en el cuello entre los trabajadores manuales. La postura de trabajo 4222 del OWAS (categoría 3) mostró una correlación altamente significativa con los trastornos musculoesqueléticos lumbares y una correlación parcial con los trastornos musculoesqueléticos cervicales. Asimismo, las posturas de trabajo 2221 y 2222 (categoría 2) se correlacionaron significativamente con los trastornos musculoesqueléticos lumbares y cervicales.

Palabras clave

Trastornos musculoesqueléticos, WinOWAS, cuestionario nórdico, empleados de oficina.

Introduction

Physiotherapists repeatedly need to use manual treatment and awkward postures in the course of their work. Anyfantis and Biska (2018) stated that physiotherapists' musculoskeletal injuries are mainly caused by work practices and manual handling. However, Cromie et al. (2000) reported that physiotherapists tend not to inform their injuries through the workers' compensation system. Musculoskeletal signs are predominant in the youth community and frequently have serious effects on their future musculoskeletal health. According to the World Health Organization (WHO, 2022), orthopedic disorders affect approximately two billion people worldwide, making them one of the leading causes of work-related disorders and decreased quality of life. Musculoskeletal disorders (MSD) are injuries and dysfunctions that have a negative impact on the human musculoskeletal system (Saleh et al. 2024). Pain is the most common sign connected to Work-related musculoskeletal disorders (WRMSDs). In this study, the term musculoskeletal disorders (MSDs) refers to injuries or dysfunctions affecting muscles, joints, tendons, ligaments, and related structures. WRMSDs are defined as MSDs in which work activities and postures are significant contributing factors. The term orthopedic disorders is used only when referring broadly to conditions involving the musculoskeletal system. Tinubu et al. (2010) stated that it could be combined with muscle tightness, stiffness, ruddiness and tumefaction of the affected areas. Verdugu et al. (2025) reported that strength training reduces falls in the elderly and Yudo et al. (2025) found that regular physical activity improves postural stability in students. Furthermore, Ratu et al. (2025) showed that geometric stretching alleviates lower back pain in nurses. Also Janageraman et al. (2025) demonstrated that neck stretching exercises relieve nonspecific neck pain. The MSD may advance in stages from mild to severe. Hurting and tiredness occur during work hours but subside during rest. The initial stage pain is a signal that the muscles and ligaments should rest and heal, or else permanent damage can occur (Silverstein et al. 2010). Symptoms in the shoulders, hands, arms, low back, neck and knees are repeatedly noticed in occupational settings, are relevant to physiotherapists and have been highlighted in previous research. Anyfantis and Biska (2018) concluded that physiotherapists often repeat the same tasks, causing spine, back and extremity injuries. Recent studies of AlAnazi and Mani (2025) and Cobos-Bermeo et al. (2025) revealed a high prevalence of musculoskeletal disorders among university staff particularly those with uncomfortable working postures or excessive physical exertion, negatively impacting performance and productivity. Hassan et al. (2025) confirmed the effectiveness of remote rehabilitation programs in alleviating upper extremity pain, such as carpal tunnel syndrome, while Pedraza-Ricra et al. (2025) demonstrated that kinesthetic anthropometric characteristics such as weight and body mass index influence spinal health among university students. Quijano Duarte et al. (2025) also showed that physical activity levels and lifestyle significantly influence the prevention of these disorders among physical therapists. Recent studies emphasized that chronic neck and low back pain usually related to prolonged sitting, poor postures and repetitive computer use or office setting for long duration (Iram et al. 2022). Furthermore, manual workers are more likely to sustain bad injuries and long-term joint degeneration due to heavy lifting and awkward postures (Ndiwa, 2020). Anyfantis and Biska (2018) gathered 320 questionnaires from physiotherapists and found pain in the neck, upper back, lower back and shoulders. Ike et al. (2017) reported that the nature of physiotherapists' work contributes to the high prevalence of WMSDs; low back pain was the most common (53.5%) and 83.3% of physiotherapists were affected. In Egypt, Doaa et al. (2015) and Abdel Raoof et al. (2015) found high prevalence rates of WRMSDs, mainly in the spine and upper limb, with back disorders most common (61.8%). Abdel Raoof et al. (2015) concluded that prevalence in Egypt is higher than in most countries. A body posture is a measure of the mechanical efficiency of muscles, balance and neuromuscular coordination (Safee et al. 2011; Alberto Bucciero et al. 2014). It changes with movement to maintain stability with minimal strain. Fuller (2011) stated that posture is influenced by general health, body build, gender, habits and workplace demands. Static posture refers to maintained positions, while dynamic posture involves movement (Kisner & Colby, 2012). Diagnosis of MSDs is supported by tests such as ENMG and MRI (Trinkoff et al. 2002). Kahraman et al. (2016) stated that the Nordic Musculoskeletal Questionnaire (NMQ) can be used for screening musculoskeletal problems and allows comparison across body regions. Kuorinka et al. (1987) developed the NMQ, dividing the body into nine parts to assess discomfort over the past year and week. The results of Kahraman et al. (2016) confirmed the NMQ reliability and validity. Glover et al. (2005) used the NMQ among UK physiotherapists also Nyland and Grimmer (2003) used it among physical therapists in Australia and Moreira and Seixas (2012) in Portugal and they found a significant MSD prevalence. Al-Eisa et al. (2012) reported that 63.9% of Egyptian and 74% of Saudi physiotherapists

sustained injuries, mostly in the neck and low back. Muaidi and Shanb (2016) found WRMD prevalence among Saudi physiotherapists at 47.7%, mainly low back (46.5%) and neck (26.6%). Gharote et al. (2016) in India reported the lower back as the most common site, followed by neck and thoracic regions, mainly due to lifting and prolonged standing. Malarvizhi et al. (2017) found neck (62.4–63.8%) and lower back (61%) most affected; teaching therapists were more impacted. They concluded that WMSDs among both clinical and teaching physiotherapists were highly prevalent. The Ovako Working Posture Assessment System (OWAS) was developed at one of the largest European makers of steel bars and profiles in Finland, OVAKOOY Company, is where OWAS was developed Takala et al. (2010). They developed the approach to assess the workload in molding steel oven reform operations. The purpose of OWAS was to determine the amount of time and frequency spent in the postures used for a particular work, to analyze and assess the issue, and to suggest remedial measures (Karhu et al. 1977). OWAS is frequently used to determine the four most important habitual back postures in workers, together with three arm postures, seven leg postures, and four categories for the weight of the load handgrip. All of this suggests that there are up to 252 potential combinations. As a result, each position a worker adopted was given a 4-digit number based on how each body part and load were classified in prior postures Takala et al. (2010). Applying OWAS involves surveying work activities, classifying postures, assigning risk categories, and assuming optimal actions. This strategy may be applied to a variety of computer software packages that allow for time savings in work and have previously been employed in further research Wahyudi et al. (2015). One benefit of implementing OWAS is that it is a straightforward and practical approach that is well-documented Takala et al. (2010) and accessible to staff from a variety of industries, including engineering, industry, and health, without the need for specialist training (Karhu et al. 1977). The OWAS model has been used by several writers to analyze surgeons, nurses, and nursing assistants in the general surgery and ear, nose, and throat specialties. According to those writers, nurses and surgeons choose dangerous positions Kant et al. (1992). Kulagowska, (2008) also examined the postures used by nurses giving narcotics and came to the conclusion that task organization determined musculoskeletal issues. Similar findings for surgical nurses were discovered a year later by Kulagowska, (2009), which led to the same conclusion. Lauer et al. (2009) used the OWAS and RULA approaches, which are comparable, to forecast the postures needed for the new surgical table for the hips, knees, and spinal column. Additionally, Bartnicka, (2015) examined surgeons' and nurses' activities using OWAS and other verification techniques, allowing for methodological discrimination. The following are the most common uses of OWAS in the health field: applied it to nurses who worked in orthopaedic surgery and discovered that the majority of the postures they performed on a regular basis were hazardous. Additionally, de Brujin et al. (1994) employed OWAS to verify the dependability of observations by using a set of typical nursing positions. Additionally, Hignett, (1994) used OWAS in conjunction with computer tools to reduce the amount of time needed for result processing. Additionally, nurses' postures before and after training sessions were assessed using OWAS Best, (1997) and Engels et al. (1998). These authors discovered that fewer hazardous postures were used during the workday when mechanical devices were used. Lastly, OWAS has also been used to assess nurses' postures while they work Stricevic et al. (2009) without the use of mechanical equipment to help them with their tasks. These postures are then compared to those that are typical when using machines or mechanical devices. Despite the extensive literature on MSDs among healthcare workers, there is a lack of studies examining the relationship between objectively assessed work postures using OWAS and self-reported MSDs among academic physiotherapists who simultaneously perform manual labor within university settings, particularly in developing countries such as Egypt. Due to the lake of studies examining the relationship between the MSDs and postures assumed by academic physical therapists and physical therapy professionals employed, therefore the analysis of physical therapist's postures and correlation of the postures to MSDs in physical therapists can help physical therapists field in adapted process economically. The current study aims to study the relationship between MSDs and work-related postures among academic physiotherapists at Suez University and physical therapy professionals employed at the same university who are also engaged in manual tasks. This study focuses on examining the physical load that combining academic roles with manual labor can place on physical therapists in order to support the development of interventions aimed at improving occupational health and the work environment in academic settings.

Method

This study was conducted in Suez University. Nordic questionnaire was used to detect the musculoskeletal disorders affect faculty members and manual physiotherapists from Suez University. Meanwhile, OWAS method was conducted to measure and categorize postures assumed by physiotherapists during work. The study included two groups: (1) academic physiotherapists performing office-based and clinical duties, and (2) physiotherapy professionals engaged primarily in manual tasks within the same university. The relationship between the developed musculoskeletal disorders and assumed postures was studied. The questionnaire was surveyed in 2025 followed by data entry, statistical analyses and applying OWAS method. In this study a descriptive cross section study was applied which did not involve manipulating variables. Also, it allowed us to look at numerous characteristics at the same time such as age, gender and BMI. It also provided data about what was happening in the study population. Furthermore, the cross section study usually utilized to look at the prevailing characteristics in a given population. The study was conducted in Suez University and focused on the Faculty of Physical Therapy population. It was approved by the Research Ethics Committee, Faculty of Medicine, Suez University (SUEZ Med-IRB/No:104). Also, the study protocol was registered at Pan African Clinical Trial Registry. (Registry: PACTR202511613227234).

Participants

The targeted participants was the physiotherapists of both genders males and females. The faculty members and manual employees including physiotherapists who were interested in participation in the survey study were chosen. This study focuses on physiotherapists working at Suez University who perform both academic (office-based) and manual clinical tasks, as well as physiotherapy professionals employed in manual roles within the same institution. Each participant was notified about their rights to pull back from the survey any time and it's not necessary to write their names. They were additionally guaranteed of the secrecy of the data gathered and that they were to be utilized just for research. All participants provided written informed consent prior to participation. Participants were informed of their right to withdraw at any time without consequences. Data were collected anonymously and stored securely with access restricted to the research team. No vulnerable populations were involved. The criteria of those included in the study aged from 20 to 55 years old with work load about 10 hours (h) to 50 h work per week and style of life and exercising regularly was observed (Campo et al. 2008; Salik and Ozcan, 2004; Cromie et al. 2000). They had no history of recent musculoskeletal injury or surgery that could affect their workplace posture. The exclusion participants criteria were physiotherapists who have musculoskeletal abnormalities due to other causes not work related (traumatic and congenital), participants who have previous operation in locomotors system, who have immunological diseases, participant under dialysis or who have cancer (Campo et al. 2008; Salik and Ozcan, 2004; Cromie et al. 2000). Number of physiotherapists determined through power analysis. The sample size was estimated after conducting power analysis based on the results of the previous studies. Fraley and Vazire, (2014) stated that the statistical power for regression analysis is the probability of a significant finding (i.e., a relationship different from 0 typically) when in the population there is a significant relationship. By convention, 0.80, which represents an expectation that 80% of random samples from the same population would find significance if there is a relationship in the population (i.e., H1 is true), is often used as a minimum acceptable level of power when estimating the sample size needed in a planned study. In general, power is dependent on the significance criteria used (nearly always $\alpha = 0.05$), sample size, and effect size. Sufficient power is not only critical for ensuring that we do not miss important significant effects, but it is also important because power may play in important role in failures to replicate findings and even in a greater chance of false positive findings (Fraley and Vazire, 2014). It was assumed that, the margin of error could be tolerated about 5% with confidence level of 95% meaning the percentage of participant who answer yes might be more than 5% away from the true answer. The true answer is the percentage could be gotten if we exhaustively surveyed everybody.

The total population size was 150 faculty members and manual employees including physiotherapists from Suez University who were selected for the current study. Furthermore, the response distribution expected from the participants was 80% meaning low skewed probability for data distribution. In terms of the assumptions above. A total of 111 questionnaires were distributed, of which 100 were completed, resulting in a response rate of 90.09%."

Procedure

A survey was conducted using Nordic Musculoskeletal Questionnaire (NMQ) checklist printed (Zenija et al. 2015) and (Alrowayeh et al. 2010) to be filled out by the physiotherapists during the physical therapy departments. Nordic Musculoskeletal Questionnaire (NMQ) is an evaluation questions for detecting and analyzing musculoskeletal disorders of different persons in different countries using indirect methods demands the standardization of the evaluation questions. It divided the human body into 9 main regions. NMQ was developed by Kuorinka et al. (1987) based on a previous medical questionnaire organized by Rose et al. (1968). The physiotherapist participant received NMQ and they were informed by the whole following procedures. The gathered data included personal information such as their ages, gender, years of employment, education level, area of specialty and the number of hours per weeks. The NMQ and an increasingly nitty gritty body-part- explicit survey with more specific body zones details was used. Other collected data was observed and NMQ checklist as follow age (years), gender (M) or (F), weight (Kg), height (cm), and work duration per (hours). The BMI is a simple index calculated from a person's weight and height. It was calculated using the following formula: weight (kg) / [height (m)]2. It provides a reliable indicator of underweight, overweight and obesity for most adults and is used to screen for weight categories that may lead to health problems. BMI was calculated and reporting of the BMI is required for all participants 20 years of age and over. Ovako Working Postures Analyzing System (OWAS) was used to analyze work related postures of the physiotherapists and ordering them into deferent four categories after ratings four postures for the body back, 3 for the body arms, 7 for the lower limbs, and 3 levels for the weight of load handled or amount of force used. OWAS method was processed using WinOWAS software.

Instruments

The measurement was including Physiotherapists height and weight and to calculate BMI using body height meter and Healthy scale weight and the NMQ was used as a checklist to be completed by the faculty members and manual physiotherapists.

1. Nordic Musculoskeletal Questionnaire

NMQ was used as a checklist. The questions at any time during the last 12 months and 7 days have every physiotherapist participate. It divided the human body into 9 main regions. The questions prepared to observe troubles or complains in the whole body regions and the scale of physical problems within a year ago. Moreover, the gathered data include some personal information like the participant age, gender, how long he/she have been employed, how many shifts per weeks and its duration.

2. Ovako Working Postures Analyzing System

Ovako Working Postures Analyzing System (OWAS) is one of the analyzing techniques and one of the most significant techniques to confirm safety level and risk level which identified with work posture. OWAS is a simple method to verify safety level which related to work posture, and to evaluate risk level which leads to corrective action (Caputo et al. 2006). OWAS method can define the movement of all parts of the body and can recommends suggestion to safer and comforter feeling while working. It was used to evaluate the work related postures in physiotherapists and analyzing repeated postures work and ordering them into different categorize using OWAS.

3. Categorizing work related postures according to OWAS method

The OWAS method is based on ratings of working postures and load 4 postures for the back, 3 for the arms, and 7 for the lower limbs, and 3 levels for the weight of load handled or amount of force used. Values from the 4 factors are combined to assess 4 categories of risk and recommended actions according to Burdorf et al. (1991) as follow:

Category 1 normal postures, which do not need any special attention;

Category 2 postures must be considered during the next regular check of working methods;

Category 3 postures need consideration in the near future;

Category 4 postures need immediate consideration.

Data analysis

The gathered data included personal information such as ages (years), age (years), gender (M) or (F), weight (Kg), height (cm), and work duration per (hours). The NMQ and an increasingly more detailed body-part–specific questionnaire with more specific body zones details was used (NMQ checklist, Appendix 1). The general NMQ delineates a body outlines into nine anatomic parts and gets some information about the scale of physical problems including pain, complain and distress within a year ago and in each of the body regions. Other collected data was observed and NMQ checklist as follow age "years", gender "M or F", weight "Kg", height "cm", and work duration per "day". Data obtained from OWAS were mainly 4 different categories according physiotherapists work related postures, where each posture describes body parts with a four digit-code namely (1) Back (2) Arms (3) Legs and (4) Load.

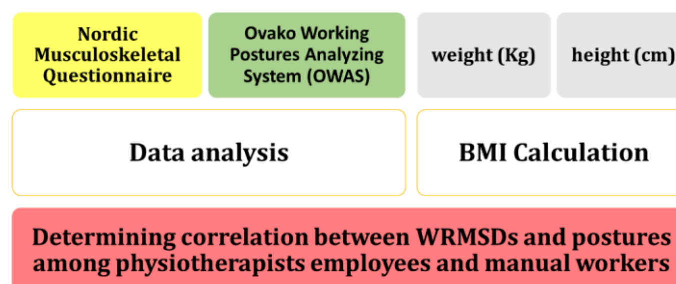
Statistical analyses were processed using the computer package of SPSS and Excel. Descriptive statistics, percentage and frequencies summarized the demographic data of the physiotherapists namely gender, age, education level, professional working experience and area specialty. Based on the collected data followed descriptive variables were used as variable averages, minimum, maximum, standard deviation (SDs), in addition to frequency, histograms and percentage (%) of participants age (years), gender (M) or (F), weight (Kg), height (cm), and work duration per (hours), (Table 1). Also, descriptive statistics were used to summarize the results of prevalence pain through the participants' whole bodies during the last 12 months and last week.

Table 1. Description of demographic variables of the participants

Variables	Description
Gender	Gender of the participants "Male or Female".
Age	Age of the participants was divided into four groups as: below 30 years, 30-34 years, 35-40 years and over 40 years.
Education level	Education level was divided into three groups as: BS.c, MS.c and PhD.
Marital status and style of life	For female married or not married, number of children, preferred clothes, shoes and if the participant used to practice type of sport or doing healthy practices etc.
working experience	physiotherapists employment years groups were 1-5 years, 6-10 years and 11-15 years.
working load hours/week	working load groups were >10 hour (h), 10-19 h, 20-29 h and 30-39 h.
Area specialty	Area specialty groups were Neurology, Cardiology Orthopedic, Geriatric, Pediatric and General Practices.
Body Mass Index (BMI)	BMI was divided into four groups according to WHO as: Normal weight (18.5 – 25 kg/m^2), Underweight < 18.5 kg/m^2, Overweight (25 – 30 kg/m^2) and Obese > 30 kg/m^2 where weight "Kg", height "cm".

Pearson correlation (r) was used to study the correlation between MSDs and work related postures in physiotherapists in Suez University, Egypt. The classes of (r) values were set as (r between 0-0.19) is regarded as very weak, (r between 0.2-0.39) as weak, (r between 0.40- 0.59) as moderate, (r between 0.6-0.79) as strong and (r between 0.8-1) as very strong correlation Additionally, Pearson's Chi-squared test was used to test the significant differences in the physiotherapists' prevalence of MSD, also to test differences in the demographic data such as gender, age, education level, working experience, working load hours/week and area specialty. Body Mass Index (BMI)of the physiotherapists among subgroups. Pearson's Chi-squared test was given according to (Plackett, 1983) and (Greenwood and Nikulin, 1996). Finally, the significant level was set at 0.05 where the alpha level was set at confidence interval 95% ($p<0.05$).

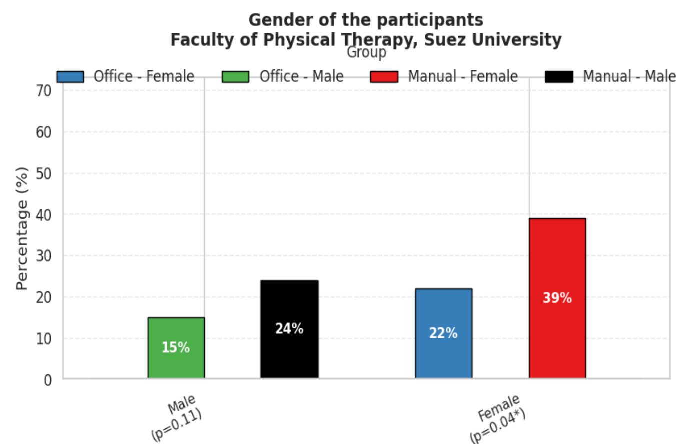
Figure 1. Flow diagram outlines the methodology included in the study.



Results

Repetitive postures assumed by physiotherapists have been associated with WRMSDs. This study investigated work related musculoskeletal disorders and postures assumed by physiotherapists by Nordic questionnaire. A total of 111 questionnaires were distributed to the participants of whom 100 completed the questionnaire giving a response rate of 90.09%. This response rate reflects the physical therapist awareness how much this work is important and it's considered reasonably adequate because from these results, where the purpose of the current study which was to examine if there was correlation between musculoskeletal disorders and work postures assumed by physiotherapist were accomplished. On the other hand, the studied social demographic data are representing gender, age (yrs), education level, professional working experience (yrs) and area specialty. Results of social description of the participants are illustrated in Figures 1-10. It indicated a significant association between the social demographic data and the MSDs. Figure 2 demonstrate the gender of the physical therapist participants. The results showed that dominant part of physical therapists in both the office and manual work groups were female (61%) while male physical therapists were few (39%). From this study it is obviously that physical therapy as profession attract generally females more than the male partners in Faculty of physical therapy, Suez University in spite of the fact that there were 6 individual doctors who did not return the questionnaires who could be either male or female.

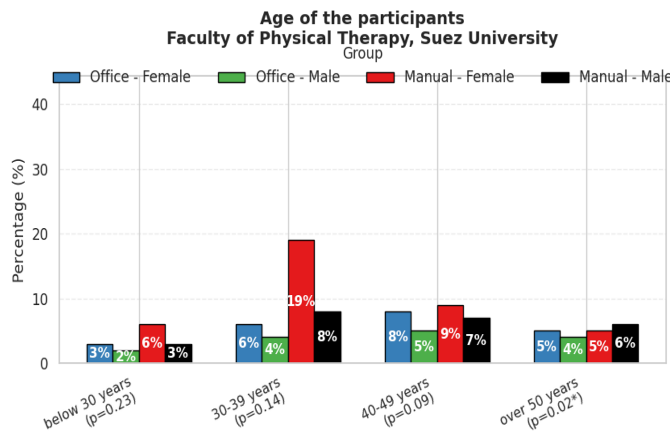
Figure 2. Gender classes of the studied participants



Additionally, Pearson chi square test demonstrated that there was very strong correlation (r=0.79) between the gender of female physical therapists and MSDs (p=0.04) however there was no significant correlation between the male physical therapist gender and MSDs with (r=0.46) and (p>0.05). It was applicable to comprehend the significance of gender in MSD.

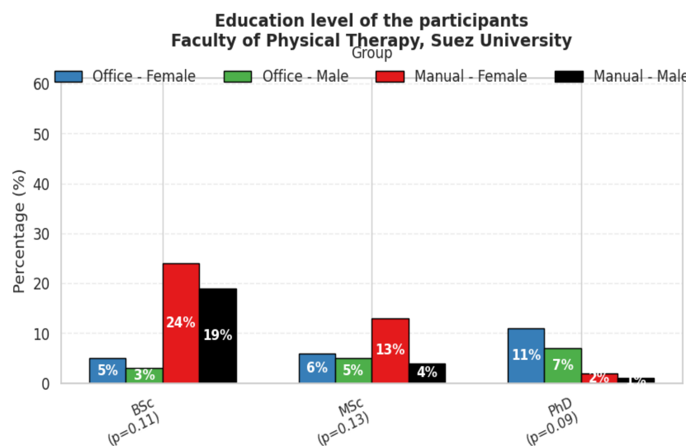
Results of age groups of the participants illustrated in Figure 3. The results showed that the mean age of the physical therapists was 32 years and the standard deviation was 10.98 (37.70±10.68). Generally, 40% of the female physical therapists who shared in the current study were in the age between 30 to 39 years old as shown in Figure 3. Moreover, the age of the male physical therapists distributed normally with 5 participants below 30 years old, 12 participants ranged from 30 to 39 years old and 12 participants ranged from 40 to 49 years old with an average about 39.49 years old. Also, the Pearson chi square test demonstrated that there was good correlation (r = 0.72) between the age of physical therapists over 50 years and MSDs and moderate correlation (r = 0.51) between the age of physical therapists ranged between 40 to 49 years old and MSDs (p=0.05) however there was no significant correlation between the age classes below 30 years and 30-39 years with MSDs (p>0.05).

Figure 3. Age of the participants



Generally, 51% of the participant physical therapists in the study were holding a bachelor of science (BS.c.) degree as shown in Figure 4. The education level of the male physical therapists distributed normally with 22 participants have B.Sc. degree, 9 participants have Master of Science (MSc.) degree and only 8 participants have Doctor of Philosophy (PhD) degree. Figure 4 describe the distribution of both male and female physical therapists were there were 29 female participants have B.Sc. degree, 19 female participants have MS.c. degree and 13 female participants have PhD degree. Although, there was weak and moderate correlation between different education levels BS.c, MS.c and PhD with (r = 0.36, r =0.44 and r = 0.53) and the results of Pearson chi square test showed no significant correlation between the education level of the participant physical therapists with MSDs (p>0.05). These results may due to the style of life for the Egyptian community in addition to unsuitable closes, choses, tables, unsuitable beds and the non-healthy daily habits.

Figure 4. Education level of the participants



The results showed that only 40% of the participant physical therapists in the study were exercising regularly, two third of them were men as shown in figure 5. Twenty-four male participants used to practice at least one type of sports (football, running…etc.) or doing healthy practices regularly. However, forty-seven of female participants mentioned they not practicing any of regular sports or doing healthy practices, that number of participants representing more than 77% of all female participants. On the other hand, the results showed that, there was weak correlation (r=0.26) between male and female who used to exercise regularly and WRMSDs while there was very strong correlation (r=0.86) between male and female who are not regularly exercising and WRMSDs. Moreover, the results of Pearson chi square test showed high significant correlation between the participant physical therapists who are not regularly exercising and WRMSDs (p=0.04). This significant correlation may due to the style of life, preferred clothes and shoes of the non-athlete participants which may lead to neck and back pain.

Figure 5. Exercising regularly of the participants

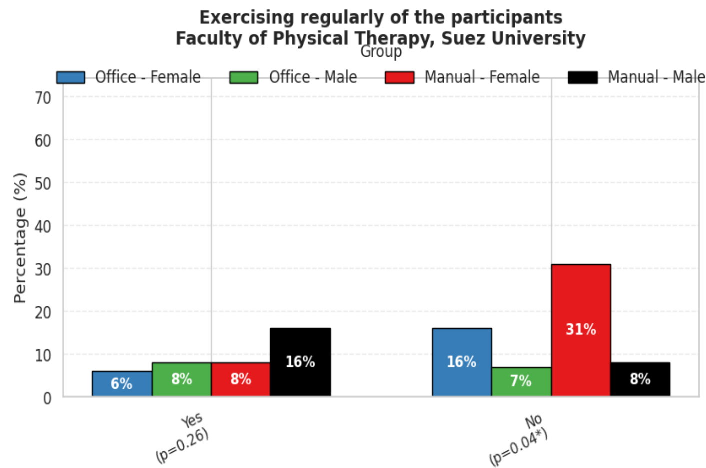


Table 2 describes marital status of the participants, the results showed that more than half of the participants (65 participants) were married, more than half of them were females and 41% were married females and have kids. Single females were 22 participants representing 22% from all of the physiotherapists while the single male participants were 13% from all of the participated physiotherapists. Most of the married males have kids (16%) and only 10 males were married and have no kids.

Table 2. Marital status of the participants

Marital status	Office work		Manual work		(r)	p-value
	Female (%)	Male (%)	Female (%)	Male (%)		
Single	9	5	13	8	0.27	0.12
Married and no kids	5	4	7	6	0.41	0.09
Married and have kids	8	6	19	10	0.85	0.04
Total	22%	15%	39%	24%		

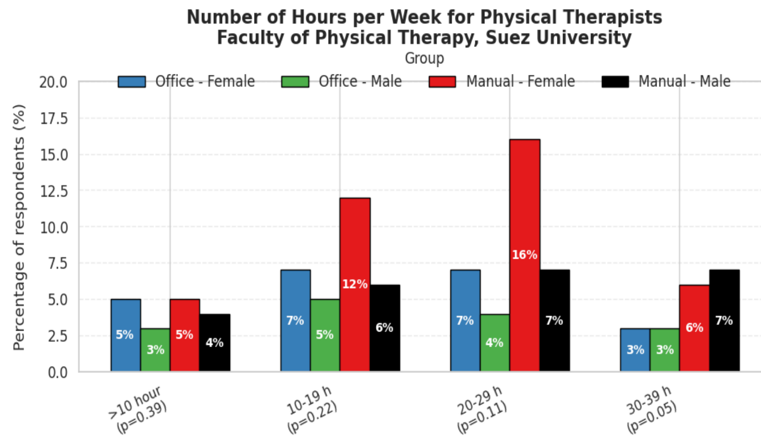
Also, the results showed that there was weak correlation (r=0.27) between male and female who are single with WRMSDs and there was moderate correlation (r=0.41) between female who are married with WRMSDs while there was strong correlation (r=0.85) between female who are having kids with WRMSDs. Moreover, the results of Pearson chi square test showed high significant correlation between the female physical therapists who have kids and WRMSDs (p=0.04). This may due to the poor posture during pregnancy which may cause complications and pain like irritated joints even after the delivery in addition to much of the back pain may experienced throughout pregnancy and then during taking care their growing babies.

Work load in terms of working hours per week

Regarding to work load, 17% of the participant physical therapists who had very little work load with less than 10 hours work per week, 10% of them were female and 7% of them were male. The results showed a good correlation for weekly working hours and the MSDs with (p = 0.05).

From the study 30% of the physical therapists worked for 10-19 hours weekly while 34% worked about 20 to 29-hour weekly and 19% worked about 30-39 hour per week as shown in figure 6.

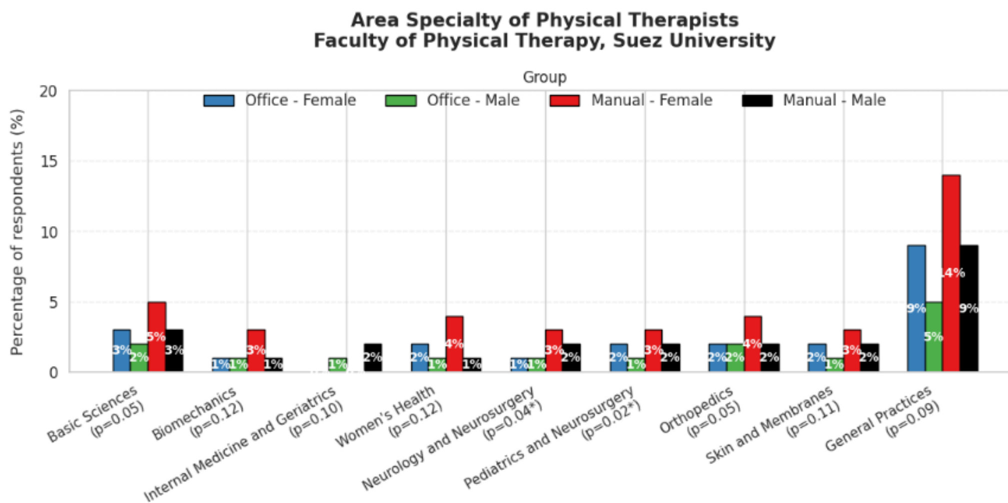
Figure 6. Working hours per week for physical therapists



Area specialty of the physical therapist participants

The results showed that area specialty of the participants were mainly neurology, cardiology, orthopedic, geriatric, pediatric and general practices specialists. The physical therapist participants are dominated by General Practices specialty with 35% of all participants as shown in figure 7. Also, the results showed that the selected sample had no female physical therapists who were specialist in cardiology and geriatric. Moreover, the results showed that 13% of the female were basic sciences, 10% of female participants were orthopedist, 7% of female participants were neurologist, 8% of female participants were pediatric specialists and 6% of female participants were general practices specialists.

Figure 7. Area specialty of the participants

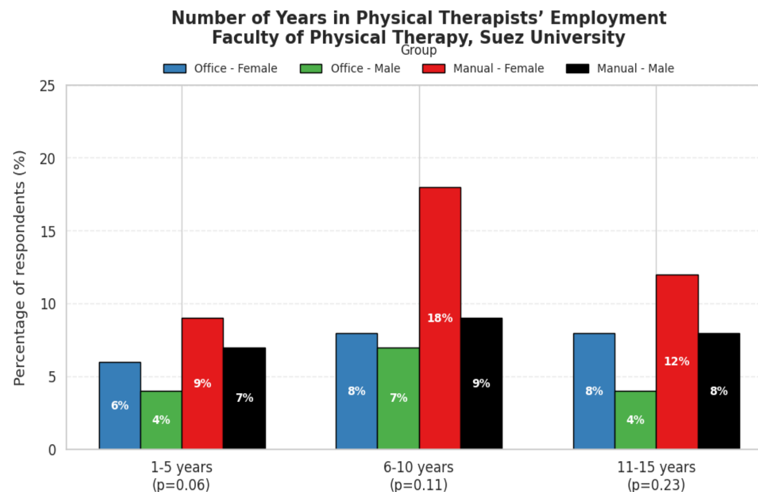


Moreover, the area specialty of the male physical therapists with 10% of the male participants were orthopedist, 8% of male participants were neurologist, 13% of male participants were pediatric specialists and 8% of male participants were geriatric specialists. Additionally, the results of Pearson correlation (r) were varied from area specialty to another where there was strong correlation between MSDs and pediatric physiotherapists (r = 0.66), moderate correlation between MSDs and neurology, geriatric and general practices physiotherapists with (r = 0.50, r = 0.42 and r = 0.49, receptively. Pearson chi square test showed no significant correlation between the area specialty of the biomechanics, internal medicine and geriatrics and women health specialists MSDs (p>0.05). However, there was significant correlation between the participant neurology, basic sciences and pediatric physical therapists and MSDs (p=0.04, p=0.05 and p=0.02, respectively).

Professional working experience in terms of years

Regarding to professional experience, the average of the work experience in MSDs was (7±3.3) years where 26% of the physical therapists in the study had a work experience of between 1 to 5 years, 15% of them were female and 5% of them were male. Less than half of the participants had 6-10 years of professional working experience and 32% of all participants had 11 to 15 years of working experience, divided into 20% female participants and 12% male participant.

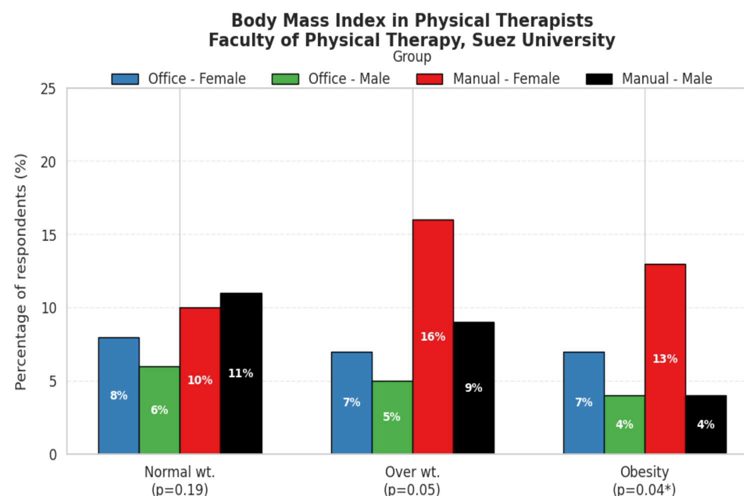
Figure 8. Years of experience for physical therapists



Body Mass Index of the participants

Body Mass Index (BMI) is a good indicator of potential health risks associated with increased weight. Regarding to BMI, 35% of the physical therapists in the study had a normal weight (18.5 – 25 kg/m2), 18% of them were female and 17% of them were male. About 37% of the participants had overweight (25 – 30 kg/m2) and about 28% had obesity (> 30 kg/m2), divided into 20% female participants and only 8% male participants. Results of Pearson correlation (r) between BMI and MSDs varied where there was strong correlation between MSDs and obesity (r = 0.69) and moderate correlation between MSDs with normal and overweight (r = 0.41 and r = 0.56, receptively). Additionally, the results of Pearson chi square test showed no significant correlation between the physiotherapists with normal weight and MSDs (p=0.19). However, there was significant correlation between overweight and MSDs (p=0.04), also obesity MSDs of physical therapists (p=0.05).

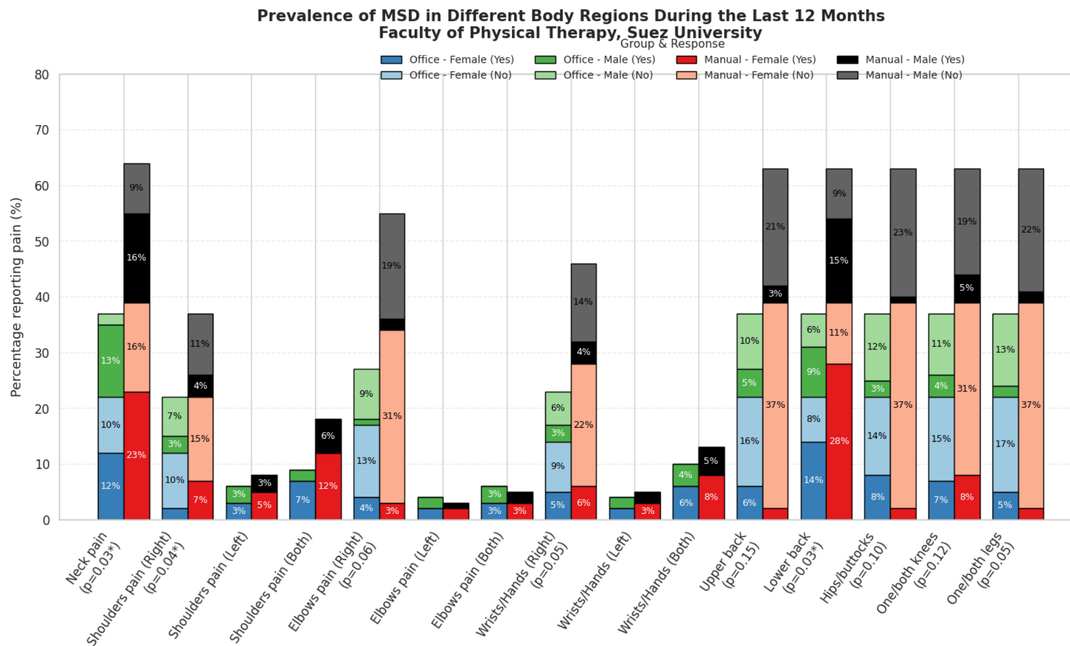
Figure 9. Body Mass Index of physical therapists



The prevalence of MSD on physical therapists

The results of prevalence pain throw the participant whole bodies during the last 12 months indicated that lower back and neck pain represented the dominant prevalence pain with 66% and 64% respectively, followed by shoulder pain and wrist/hands with rates about (57%) and (50%) then one/both knees (24%) also both hips/buttocks were the lowest one with 15% as shown in figure 10.

Figure 10. Prevalence pain in different body regions in last 12 months



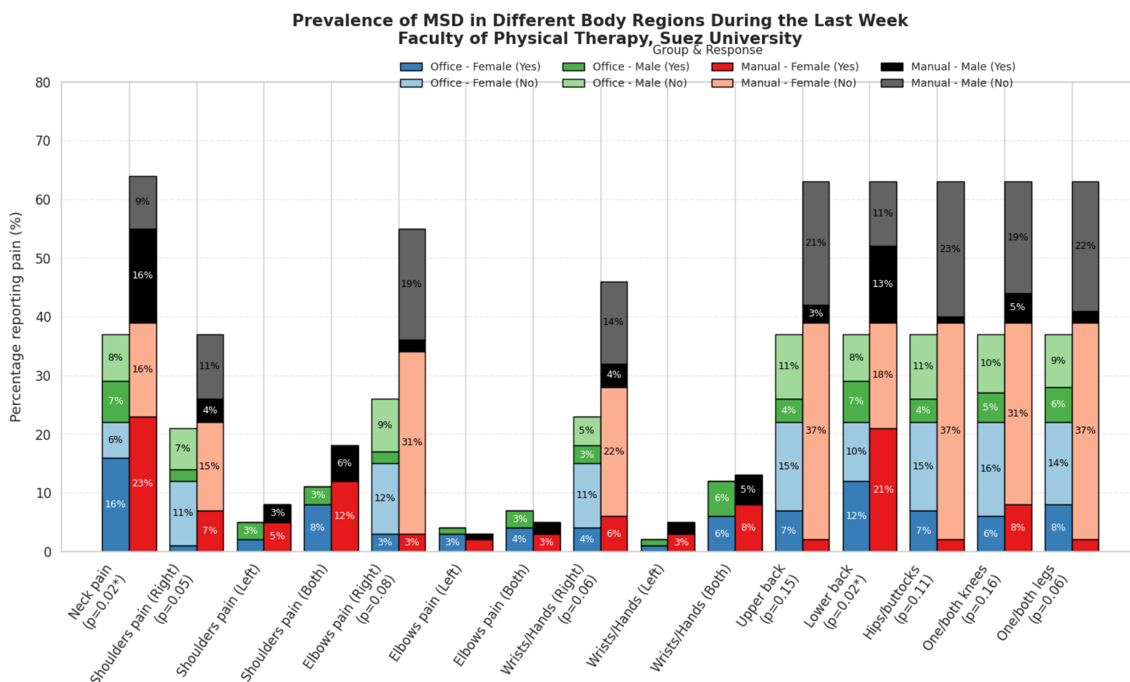
Concerning neck pain, 64% of the physical therapists had experienced troubles in their necks compared to 36% who disagreed that they had not troubles in their necks. This clears that neck pain is a quite public problem among physical therapists especially the female who agreed they had neck problems with 35% of all participants compared with 29% for males of all participants. In concurrence with the above statements, sleep mode issues and accompanying physical side effects, for example, headache happened among doctors working on Faculty of physical therapy, Suez University. The results showed that 28% of the participants agreed that they had elbow problems while 72% denied having troubles in their both elbows. Moreover, the results showed that more than ten percent of the participants had pains in both right and left elbow, specifically 6% female and 5% male who had such pains. The right elbow was observed more than the left elbow with percentage of 7% female, 3% male, 4% female and 3% male respectively. Physical therapists who stated that they had pain in both of their shoulders were 27% while 43% of the participants disagreed having such pains. Physical therapists usually feel shoulder pain due to their work environment, which include dealing with overloads for example, doing therapy treatment for patient leg to the other one. Concluding, junior physical therapists should to be train well on not harmful methods of dealing with patients or use machinery to decrease the injuries. The results showed that 49% of the participants agreed that they had wrist and hand troubles while 51% denied having troubles in their wrists/ hands. Moreover, the results showed that 23% of the participants had pains in both right and left wrist or hands, specifically 14% female and 9% male who had such pains. The right wrist or hands were observed more than the left wrist or hands with percentage of 11% female, 7% male, 5% female and 4% male of whole participants respectively. Figure 10 show the prevalence upper back pain in last 12 months. Regarding to the upper back pain, 16% of the participant physical therapists in this study assumed that they had troubles in their upper back while 84% denied having such troubles. Since physical therapists do most of their duties with twisted movement and not very well posture doing it again and again, this is the main source of UBP. It is quite normal for a physiotherapist like other medicine careers to harm their upper back when carrying and holding patients,

twisting or bending. Additionally, sitting at an invalid designed chairs for a long time may make upper back muscles fix, stiff and turn out to be solid, which is quite prevalent for physical therapists since they usually are not provided with comfortable structured seats to suit their work as noticed during the current study. Also, it describe the prevalence lower back pain in last 12 months. From this study, 66% of the physical therapists stated that they had experienced lower back pain while 34% denied having lower back pain. The high frequency of LBP might be caused by physical therapists spending long time standing, treating and moving their patients. Regarding to Hips or Buttocks pain, 14% of the physical therapists assumed that they had troubles of their hips or buttocks while 86% denied of having troubles at these regions of their bodies. Sitting on ineffectively designed seats may be the main source of having hips or buttocks troubles. Physical therapists who stated that they had pain in both of their legs were 11% while 89% of the participants disagreed having such pains. Physical therapists complete many of their tasks standing for long time and thus this might be a contributing reason for ankles, legs and feet pains. Also, the prevalence one/both legs pain in last 12 months within female 7% of all participants denied had such pain. On the other hand, the prevalence one/both legs pain in last 12 months within male (2 frequency) about 4% of all male participants denied had such pain.

The prevalence of MSD on physical therapists during the last week

The results of prevalence pain throw the participant whole bodies during the last week indicated that neck pain and shoulder pain represented the dominant prevalence pain with 62% and 56% respectively, followed by lower back pain (53%) wrist/hands pain (49%). Statistical results for neck pain, 62% of the physical therapists had experienced troubles in their necks - most of them were female working manually with total percent 23% and around 16% female with office work - compared to 38% participant who disagreed that they had not troubles in their necks (figure 11).

Figure 11. Prevalence pain in different body regions in last week



Additionally, statistical results for elbow pain showed that only 29% of the participants had pains in one or both elbows, specifically 18% female and 11% male who had such pains in right or left elbow. Those who feel pain in the right elbow was observed more than the those who feel pain in left elbow with percentage of 6% female, 4% male, 5% female and 2% male respectively. Results of the prevalence lower back pain in last week showed that 53% of whole participants stated they experienced low back pain during the last week. Specifically, 33% of all participants were female who suffered from lower pain and around 20% were male who had been experienced LBP during the last week. That's might be regarding to the repetitive duties done by physical therapists again and again with twisted movements

and not very well postures which might be the main source of LBP. Additionally, physiotherapists who working in Faculty of physical therapy, Suez University spend long periods sitting at an invalid designed chairs, treating and moving their patients. Regarding to the upper back pain, 16% of the participant physical therapists in this study assumed that they had troubles in their upper back while 84% denied having such troubles.

Results of Ovako Working Postures Analyzing System analysis

Figure 12 illustrate the working conditions correlated to the physical therapy working postures for physiotherapists working at Faculty of physical therapy, Suez University, Egypt. the results showed that 12% of physiotherapists constantly stand for extended periods of time, 27% frequently do so, 53% occasionally do so, and only 8% never do so. There were 4% of physiotherapists who sat for extended periods of time every day, 22% who did so frequently, 51% who did so occasionally, and around 23% who did not. The findings also showed that about 81% of participants believed they never worked for extended amounts of time on a video display, 12% sometimes, 6% frequently, and 2% consistently. The findings also revealed that 83% of participants said they never or occasionally walk for extended lengths of time while performing their jobs, while 12% and 2% said they do so frequently and usually, respectively.

Figure 12. Working conditions correlated to the physical therapy working postures for physiotherapists at Faculty of physical therapy, Suez University

On the other hands, approximately 67% of participants said they never or occasionally worked while kneeling for extended periods of time, 28% said they frequently worked while kneeling for extended periods of time, and 5% said they only ever worked while kneeling for extended periods of time. Additionally, 35% of participants said they frequently or usually work with their hands above shoulder height, whereas around 65% of participants said they seldom or occasionally do so. The findings also revealed that 76% of physiotherapists never used their hands below the knee, 16% did so sometimes, and 8% said they did it often or consistently. Additionally, 96% of participants said they never or occasionally reach remote objects while doing their responsibilities, while 4% said they only frequently or usually do so. Regarding to carrying loads, 67% of participants said they always lift or carry less than 5 kg, 28% said they do so sometimes or occasionally, and only 5% said they never do so. Additionally, around 60% of participants said they seldom or occasionally lift or carry things exceeding 5 kg, whereas 40% of individuals said they do so frequently or constantly. The findings also revealed that around 66% of individuals never or occasionally pushed or pulled items exceeding 5 kg, whereas 34% of participants said they often or frequently did so. Furthermore, just 11% of individuals occasionally dozed or fell

when transporting goods, while 89% never did so. Only 42% of people said they occasionally routinely applied force with their hands or arms, compared to 57% who said they did so frequently. Regarding to the use of vibrating hand equipment, such as massage machines, 20% of participants reported using them frequently or always, whereas 80% said they either occasionally or never used them. According to the data, 60% of participants never drive, 20% occasionally, and 20% frequently or usually do so. Results on the prevalence of bending and/or twisting with your upper body many times per hour revealed that 6% of participants always bowed and/or twisted with their upper bodies many times per hour, 72% thought they did so frequently or occasionally, and only 22% said they never did. About uncomfortable postures, 88% of participants reported sometimes or occasionally working in difficult postures, 4% claimed they always worked in awkward postures, and just 8% said they never worked in awkward postures.

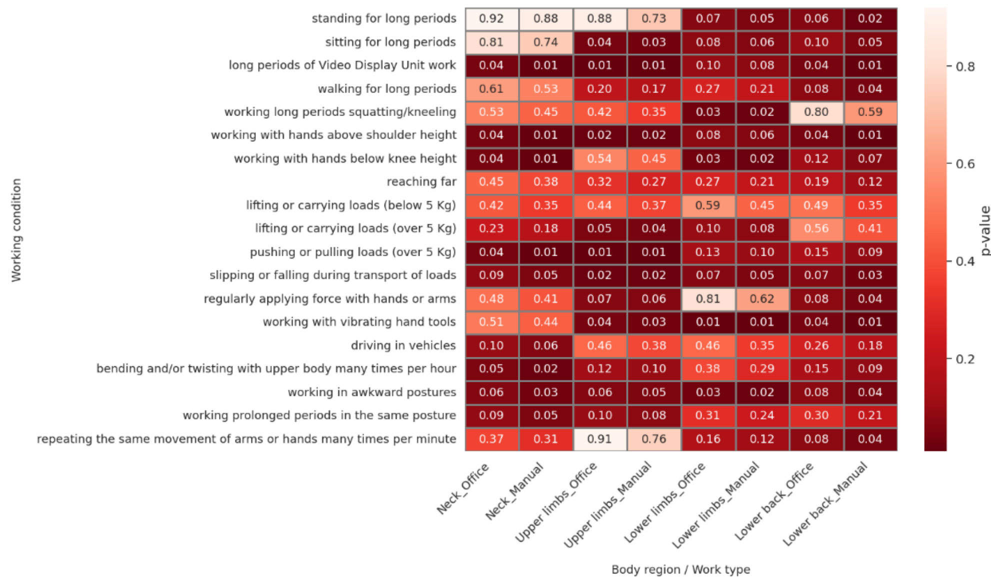
Correlation of MSDs with the physiotherapists postures

Figure 13 illustrate the relationship between MSDs and the working environment of physiotherapists at Suez University's Faculty of Physical Therapy. With r = 0.84, 0.88, 0.87, 0.88, and 0.82, respectively, the Pearson correlation (r) results demonstrated a very strong correlation between lower back pain and standing for extended periods of time, pushing or pulling loads (greater than 5 kg), applying force with hands or arms on a regular basis, bending and/or twisting the upper body numerous times per hour, and repeating the same movement with hands or arms numerous times per minute. Additionally, there was a substantial association (r = 0.79 and 0.72, respectively) between lower back discomfort and working in uncomfortable postures and prolonged sitting.

Figure 13. Correlation (Pearson r) of MSDs with Working Conditions of Physiotherapists at Faculty of Physical Therapy, Suez University

Figure 14. illustrate the significant correlation between MSDs and working conditions of physiotherapists working postures at Faculty of physical therapy, Suez University, Egypt. The results demonstrated a significant correlation between lower back work-related musculoskeletal disorders and frequently applying force with hands or arms (P=0.02), repeating the same movement of arms or hands many times per minute (P=0.02), pushing or pulling loads over 5 kg (P=0.03), bending and/or twisting with upper body many times per hour (P=0.03), standing for extended periods of time (P=0.04), and sitting for extended periods of time (P=0.05).

Figure 14. Correlation of MSDs with Working Postures of Physiotherapists at Faculty of Physical Therapy, Suez University



The results also indicated that neck work related musculoskeletal disorders was significantly correlated with bending and/or twisting with upper body many times per hour (P=0.04) and working in awkward postures (P=0.05). On the other hands, the upper limbs work related musculoskeletal disorders was significantly correlated with lifting or carrying loads over 5 Kg (P=0.02), working with hands above shoulder height (P=0.04), regularly applying force with hands or arms (P=0.04) and working with vibrating hand tools (P=0.05). Furthermore, the lower limbs work related musculoskeletal disorders was significantly correlated with working long periods squatting/kneeling (P=0.04) and standing for long periods (P=0.05).

Results of OWAS categories

The results of NMQ questionnaire showed that most physiotherapists had discomfort while doing the bulk of their activities. Eight postures (60%) were classified as category 1, according to OWAS method. Additionally, as indicated in Figure 15, seven postures with 36 frequencies were classified as category 2 and one posture with 4 frequencies was classified as category 3, indicating a significant risk of MSD. Analysis of the recommendations for action revealed that the back twisted and bent situations of physical therapists fall into category 2, which requires improvement soon. Additionally, standing with both knees bent is a category 2 work posture that has to be modified.

Figure 15. WinOWAS observation

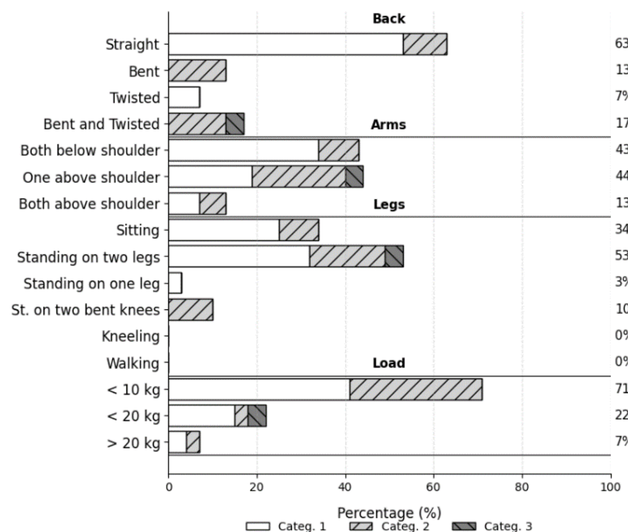


Table 3. Correlations of MSDs with work postures OWAS categories

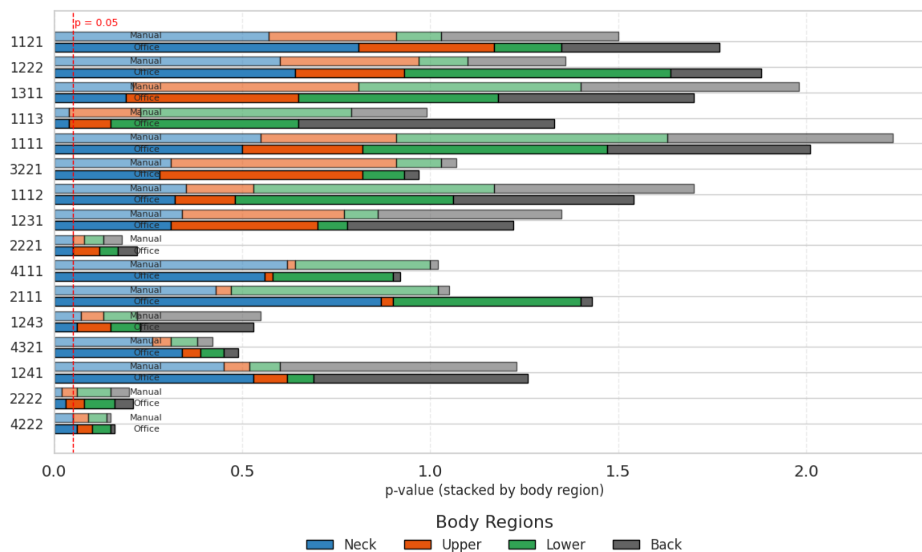
Postures	Category	Frequency (%)		p-value							
				Neck		Upper limb		Lower limb		Lower back	
		Office work	Manual work	Office work	Manual work	Office work	Manual work	Office work	Manual work	Office work	Manual work
1121	1	9	7	0.81	0.57	0.36	0.34	0.18	0.12	0.42	0.47
1222	1	5	4	0.64	0.60	0.29	0.37	0.71	0.13	0.24	0.26
1311	1	3	4	0.19	0.21	0.46	0.60	0.53	0.59	0.52	0.58
1113	1	1	3	0.04	0.04	0.11	0.19	0.50	0.56	0.68	0.20
1111	1	6	2	0.50	0.55	0.32	0.36	0.65	0.72	0.54	0.60
3221	1	2	5	0.28	0.31	0.54	0.60	0.11	0.12	0.04	0.04
1112	1	2	4	0.32	0.35	0.16	0.18	0.58	0.64	0.48	0.53
1231	1	1	3	0.31	0.34	0.39	0.43	0.08	0.09	0.44	0.49
2221	2	2	6	0.05	0.05	0.07	0.03	0.05	0.05	0.05	0.05
4111	2	1	6	0.56	0.62	0.02	0.02	0.32	0.36	0.02	0.02
2111	2	1	1	0.87	0.43	0.03	0.04	0.50	0.55	0.03	0.03
1243	2	1	2	0.06	0.07	0.09	0.06	0.08	0.09	0.30	0.33
4321	2	2	4	0.34	0.26	0.05	0.05	0.06	0.07	0.04	0.04
1241	2	2	5	0.53	0.45	0.09	0.07	0.07	0.08	0.57	0.63
2222	2	1	2	0.03	0.02	0.05	0.04	0.08	0.09	0.05	0.05
4222	3	1	3	0.06	0.05	0.04	0.04	0.05	0.05	0.01	0.01

Table key

	(1st) Back		(2nd) Arms	(3rd) Legs	(4th) Load
1	Straight	1	Both below shoulder	1 Sitting	1: < 10 kg
2	Bent	2	One above shoulder	2 Standing on two legs	2: < 20 kg
3	Twisted	3	Both above shoulder	3 Standing on one leg	3: > 20 kg
4	Bent and twisted			**4** Standing on two bent knees	

* Every posture describes part of the body with digital code contains four numbers namely (1st) describe Back posture (2nd) describe Arms posture (3rd) describe Legs posture and (4th) describe the Load; e.g. (3122) posture was Twisted back, arms both below shoulder standing on two legs and the load < 20 kg

Figure 16. Correlations of MSDs with work postures OWAS categories



The Pearson chi square test was performed using the OWAS results and the physical therapists' WRMSDs prevalence pain results. Figure 16 show the significance of WRMSDs and work postures assumed by physiotherapists at Faculty of physical therapy, Suez University. According to the results of the Pearson chi square test, there was a significant correlation (p-value = 0.01) between the musculoskeletal disorders related to the lower back and one posture (4222), which was classified as OWAS category 3. The same posture also showed a significant correlation with the musculoskeletal disorders related to the neck and upper limbs. Five postures categorized as OWAS category 2 also showed a strong correlation with lower back work-related musculoskeletal disorders. Additionally, there was a significant correlation between posture 2222 and musculoskeletal disorders connected to neck work. Additionally, there was a significant correlation between lower back WRMSDs and five postures that were categorized as OWAS category 2: 2221, 2222, 4111, 4321 and 2111 (P<0.05). Additionally, there was a

significant (P=0.02) correlation between neck WRMSDs and posture 2222, category 2 and a partial correlation (P=0.05) between posture 4222, category 3. WRMSDs of the upper limbs showed a strong correlation with posture 4222, category 3 (P=0.04). Additionally, there was a significant correlation between MSDs in the upper limbs and postures that were categorized as category 2, namely postures 2221 (P=0.03) and 4111 (P=0.02). Additionally, there was a partial correlation between it and postures 4321 (P=0.05) and 2222 posture.

Discussion

The current work showed that approximately 90.09% of the participating physiotherapists completed the questionnaire, spending about 17 to 23 minutes filling it out. This was near to the results reported by Abdel Raoof et al. (2014). However, it disagreed with Al-Eisa et al. (2012), Doaa et al. (2015) and Alrowayeh et al. (2010). This might be a sign to the importance of the study about the correlation between MSDs and work postures assumed by physiotherapist working in Faculty of Physical Therapy, Suez University. These results may be due to the importance of the current research for the participants. Regarding to the participants' social demographic characteristics, the results showed a statistically high significant relationship between MSDs and work postures assumed by physical therapists especially among female physical therapists (p = 0.00). This finding is deal with findings from various previous studies Doaa et al. (2015); Nordin et al. (2011); Alrowayeh et al. (2010); Adegoke et al. (2008) and Nyland and Grimmer (2003). It may due to female physical therapists are physically softer and more fragile than male physical therapists. The Pearson chi square test demonstrated that there was high significant correlation between age and MSDs (p<0.05). This finding was near to the prevalence reported in previous work in Egypt by Al-Eisa et al. (2012), Kuwait by Alrowayeh et al. (2010) and Australia by Nyland and Grimmer (2003). However, this finding disagreed with findings from Iran by Nazari et al. (2017), Egypt by Doaa et al. (2015) and from Nigeria, Adegoke et al. (2008). It may due to the less experience within junior physiotherapists which may effects on them when they getting older. Education levels were not significant with MSD (p > 0.05). Adegoke et al. (2008) in a similar study at National hospital in Nigeria reported the same finding. The p-value for weekly working hours between 30-39 hour/week and the MSD was 0.04 consequently there was a high correlation. Due to their constant exposure to physical loads, manual laborers have a stronger connection to and greater impact in most occupational roles involving mechanical stress, such as prolonged standing, lifting and pushing heavy weights and strength training. Furthermore, because office workers spend a lot of time sitting and not moving much they are more likely to be affected by situations such as prolonged sitting or working in front of a screen. These differences lend credence to the theory that musculoskeletal damage is exacerbated not only by the type of posture but also by its frequency and duration especially in those engaged in continuous physical activity. OWAS statistics show that manual laborers spend their days on their feet, lifting heavy loads and often working in uncomfortable positions. This physical exertion puts significant strain on their knees and backs therefore they face a higher risk of musculoskeletal disorders. Office workers face a different set of problems as they usually set for long hours in front of computers repeating the same arm &hand movements continually. This type of routine often causes them neck, shoulder and wrist pain. Interestingly, both groups rarely report slips or falls at work, suggesting a generally safe working environment. Repetitive fine motor tasks keep showing up especially in jobs that involve manual cleaning or endless data entry. That's a problem that can't be ignored. Some physiotherapists often work for long periods due to some special arrangements or agreements with the work-partners so that they can expand their off days. Performing the same task again and again for long periods of time predisposed the physical therapist to MSDs; like carrying out sensors during the physiotherapy session by physical therapists while standing causes MSDs. In a study done by Doaa et al. (2015) showed a statistically significant relationship between Working hours/week and MSD, while this finding disagreed with the finding of Alrowayeh et al. (2010) in Kuwait and Adegoke et al. (2008) in Nigeria. The results also indicated that there was high significance between BMI and MSDs. These results agreed with previous finding of Nordin et al. (2011) in Malaysia, Adegoke et al. (2008) in Nigeria and Nyland and Grimmer (2003) in Australia. Additionally, the results of Pearson chi square test showed significant correlation between the participant neurology and pediatric physical therapists and MSD (0.05 ≤ p = 0.04). This finding was close to the prevalence reported in previous work in Egypt by Doaa et al. (2015) and Nordin et al. (2011) in Malaysia. However, this finding disagreed with findings from Kuwait done by Alrowayeh et al. (2010).

These results may be due to the changes on the female body fitness after getting children which may effect on the female weight especially with the caesarean labor operations. Regarding to the participants exercising regularly the results showed high significant correlation between the participant physical therapists who are not regularly exercising and WRMSDs; these results agreed with previous finding by Doaa et al. (2015) who find that 61% of the Egyptian physiotherapist participants who are not regularly exercising had WRMDs for the past one year. This correlation with MSDs may due to the style of life for Egyptian physiotherapist participants and also their preferred clothes and selected shoes which may lead to neck and back pain. Regarding to professional experience, 35% of all participants had 11 to 15 years of working experience, divided into 19% female participants and 15% male participant. This finding is deal with findings from Nordin et al. (2011) and conflicted with Doaa et al. (2015); Alrowayeh et al. (2010) and Adegoke et al. (2008). Office workers and manual laborers at Suez University showed markedly different risk patterns for musculoskeletal disorders, according to statistical analysis of OWAS categories and reported musculoskeletal disorders. Neck discomfort showed up mainly among office workers, especially those stuck in the category 2222 posture that's the slouching position with one arm raised. This points to common causes of neck &shoulder pain in offices-based work. Also, postural immobility was not strongly associated with limb pain, highlighting how the upper spine and neck bear the brunt of these conditions. Manual laborers faced a different pain as the results showed significant correlation between lower back pain and various body postures ($p < 0.01$ for 4222, $p < 0.03$ for 2221, $p < 0.03$ and $p < 0.04$ for 2222 and $p < 0.04$ for 4111). Discomfort in the upper and lower extremities was also associated with stressful postures ($p < 0.03$ for 4222, $p < 0.04$ for 2221, $p < 0.04$ for 4111 and $p < 0.12$ for 2321). Office workers and manual laborers face different risks. Office jobs strain the neck and shoulders, while manual labor especially with repetitive lifting, twisting and uncomfortable postures places a real biomechanical burden on the lower back and extremities. These patterns highlight clear occupational risks for both groups.

According to the NMQ 72% of physical therapists stated that they have had the signs of MSD in at least one part of the nine determined body parts during the last 12 months. The most common signs were in the lower back (66%) followed by neck pain (64%) represented the dominant prevalence pain, and then shoulder pains (57%), wrist/hands (50%) then one/both knees (24%), also h hips/buttocks were 15%. These results are similar to many previous studies that done in other countries, although there are some differences in prevalence and regions of the complaint. In Saudi Arabia, Muaidi and Shanb (2016) revealed that low back pain (46.5%) and neck pain (26.6%) pain were the most common regions of musculoskeletal problems using Nordic questionnaire.

Table (4) summarizes the comparison between our finding and the worldwide previous results. Regarding to our results and the literatures studies the most common disorder is lower back pain. Doaa et al. (2015) and Adegoke et al. (2008) showed similar statistics for back pain among the Egyptian and Nigerian physical therapists with about 67.9% and 69.8 respectively. Research from Kuwait has also shown that LBP is the most common musculoskeletal pain with 47.6%, Alrowayeh et al. (2010). Asian studies report the same with LBP rates between 51.7% in Malaysia, Nordin et al. (2011) and 31.7% in Iran, Nazari et al. (2017). This finding is quite near to Al-Eisa et al. (2012) who stated the most prevalence musculoskeletal pain among the Egyptian physical therapists is lower back with 23.4%. Furthermore, this finding is in contrast with Abdel Raoof et al. (2014) who stated that shoulder and knees are higher risk factors than LBP with rates about 68.3%, 62.1% and 43.7% respectively.

Table 4. Summarize of the most prevalence musculoskeletal pain among the worldwide physical therapists

Region Reference		Neck	Shoulder	Elbow	Wrist/ Hand	UB	LB	Hips	Knee	Legs
Abd El Hay et al. (2019)	Egypt	65	58	14	40	16	75	5	35	6
Nazari et al. (2017)	Iran	26.8	19.5	12.2	34.1	17.1	31.7	7.3	29.3	7.3
Doaa et al. (2015)	Egypt	63.2	58.5	3.5	56.6	17	67.9	6.6	53.8	5.5
Abdel Raoof et al. (2014)	Egypt	41.7	68.3	2.7	29	14.6	43.7	5.7	62.1	32
Al-Eisa et al. (2012)	Egypt	25	15.3	5	14.5	6.5	23.4	1	8	4
Alrowayeh et al. (2010)	Kuwait	21	13	4	11	19	47.6	3	11	6
Nordin et al. (2011)	Malysia	46.5	-	-	-	-	51.7	-	-	-
Adegoke et al. (2008)	Nigeria	31.1	22.2	5.6	20.6	14.3	69.8	6.3	15.9	9.5

The results also mentioned that neck pain is a common vocational problem among physical therapists with high rate about 65% and has been previously reported at rates between 63.2% in Egypt (Doaa et al. 2015), 46.5% in Malaysia (Nordin et al. 2011), 41.7% in Egypt (Abdel Raoof et al. 2014), 31.1% in Nigeria (Adegoke et al. 2008) and 21% in Kuwait (Alrowayeh et al. 2010). The results of this study disagreed with that of Nazari et al. (2017), Al-Eisa et al. (2012) and Alrowayeh et al. (2010) who showed low prevalence of shoulders pain among physical therapists under investigation with low rates about 19.5%, 15.3% and 13% respectively. Also, Al-Eisa et al. (2012) and Alrowayeh et al. (2010) showed prevalence of wrists and hands pain among physical therapists with low rates about 14.5% and 11%. Wrists/hands and shoulders are commonly utilized to do the majority of all duties by physical therapists such as handling treatment devices, massage machines, pediatric and manual therapy; therefore, the physical therapists are commonly experience these pains sometimes.

Observation results of working conditions correlated to MSDs of physical therapists declared that bending and/or twisting with your upper body many times per hour, working in awkward postures, working with your hands above shoulder height and regularly pushing or pulling loads over 5 Kg are the most significant work conditions affecting on MSDs of physical therapists at Faculty of Physical Therapy, Suez University. Moreover, the results showed that lower back pain and neck pain were highly significant correlated with regularly applying force with hands or arms and bending and/or twisting with upper body many times per hour. The findings also showed that lifting or carrying loads weighing more than five kilograms was highly correlated with upper limb pain, while working long hours, squatting, kneeling, and standing for extended periods of time were significantly correlated with lower limb pain. These findings were consistent with earlier findings reported by Abdel Raoof et al. (2014) and Adegoke et al. (2008), who stated that performing similar tasks repeatedly and lifting or transferring patients have been linked to the prevalence of low back pains. On the other hands, the results of posture analyses using OWAS method in showed that 59% body postures were classified as Category 1 (normal postures), 35% body postures were classified as Category 2 (stressful postures) and 5% body postures were classified as Category 3 (harmful postures).

Regarding the significance of MSDs with work postures OWAS categories, the results of the Pearson chi square test showed that there was a highly significant correlation between MSDs in the lower back and upper limbs and posture 4222 (category 3), as well as a partial correlation with MSDs in the neck among physical therapists. In the meanwhile, there was a substantial correlation found between lower back, upper limb, and neck MSDs and posture 2222 (category 2) and posture 2221 (category 2). Although there were few applied studies of MSD among physical therapists using OWAS analysis, Bartnicka (2015), Stricevic et al. (2009), and Engels et al. (1994) demonstrated that the use of appropriate mechanical machines reduced the awkward postures compared to those common manual medical methods. The main sources of the unsuitable postures were heavy lifting exceed the limit of 15-20 kg, work duties on one or two bent knees condition, unsuitable height of work level which cause lumbar torsion flexion and unsuitable lower overstated postures.

Conclusions

The conclusion drawn from this study indicates that, there was a significant correlation between MSDs and work-related postures assumed by physical therapists working in Faculty of physical therapy, Suez University. OWAS work posture 4222 (category 3) showed a limited correlation with neck MSDs and a strong correlation with lower back and upper limb MSDs. In the meanwhile, there was a substantial correlation found between lower back, upper limb, and neck MSDs and work posture 2222 (category 2) and work posture 2221 (category 2). Social demographic characteristics were highly correlated to MSD namely, there was high significance between the female participants and MSD, BMI was highly correlated to MSD, the age between 35 to 40 years old was high significant with physiotherapists ($p<0.05$), education level was not significant with MSD ($p > 0.08$). Females, those over 40, overweight or obese individuals, and those who do not engage in regular physical activity were found to be at the highest risk. Neurology and pediatric physical therapists was significant with MSD. About 70% of physical therapists complained from MSD signs during the last 12 months. The most common signs were in the lower back, neck, shoulder and limbs were the lowest affected body regions. The study concludes that working in the same positions for long periods, treating a high number of patients and carrying or transferring

dependent patients were risk factors of MSD identified. The results of the Over-the-Age Analysis of Physical Disorders (OWAS) confirmed a strong association between WRMSDs and certain work postures, such as prolonged standing or sitting, repetitive bending or twisting of the upper body, lifting or pushing loads exceeding 5 kg, repetitive upper limb movements, and working in uncomfortable positions. These findings indicate clear ergonomic (environmental and kinetic) risks in the physiotherapy profession that require urgent intervention to mitigate them. Based on OWAS analyses, three actions are recommended: lowering the category 3 work posture of standing on two legs with a twisted back and one arm above the shoulder; improving the category 2 work posture of standing on two bent knees; and ensuring that the weight capacity does not regularly exceed 15-20 kg. It also recommends conducting larger-scale future studies involving different institutions to evaluate the effectiveness of the proposed ergonomic interventions.

Acknowledgements

The Authors would like to extend their gratitude to Suez University staff, particularly to the Faculty of Physical Therapy staff, for providing the ideal environment and support for conducting this study. Our sincere thanks also go to the faculty, administrative staff and all participants for their valuable time and cooperation. Without their contribution, this research would not have been possible.

Financing

This research did not receive any financial support or funding from external sources and was conducted solely through the personal efforts of the authors.

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