



# The Impact of Improper Body Posture on Office Workers' Health

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## Abstract

Recent data has shown increasing rates of musculoskeletal disorders among the working community. These health-related complications are considered to be amongst the leading causes of disability, and limitation of motion within modern office workers. Many of these disorders are commonly caused by improperly accommodated workplaces. The importance of this study surfaces around the challenges that will be faced during the implementation of Saudi vision's 2030; if this topic is not addressed adequately.

The study aims to detect and prevent office related injuries by investigating their associations with improper workstation ergonomics. This was conducted within the framework of studying the current situation of office ergonomics with focus on sitting postures. Correlations between workers' musculoskeletal pains, and their habits were evaluated.

For collecting the necessary data, a thirty-item questionnaire was distributed to more than one thousand randomly selected workers within Saudi Arabia. This questionnaire was developed to better study the personal demographics, medical information, muscular pain, physical therapy history, workstation ergonomics, and sitting practices.

After filtering and analyzing the collected data, the results of the survey indicated that 78% of the total participants had experienced some sort of musculoskeletal pains, from which 84% of them stated that their sitting postures are awkward, during their working hours. Also, from the total number of musculoskeletal pain sufferers, approximately 32% visited a physical therapy clinic seeking relief for their pains. However, only 39% of them benefitted from the physical therapy interventions, whereas 61% did not. From the individuals whom did not respond to physical therapy, 80% of them identified that they were equipped with ergonomically inconvenient workstations or they were not aware of the correct way to occupy their workstations. To a greater extent, 74% of the total number of participants were supplied with ergonomically inconvenient workstations, which suggests that the employment of anthropometry and workstation ergonomics is not up to standards in Saudi Arabia, causing an extensive impact in escalating muscular pain.

In conclusion, raising the awareness of the population regarding the importance of workplace ergonomics is critical; after highlighting the risks of awkward sitting postures. It is worth mentioning that the appropriate employment of office ergonomics requires the cooperation of both; employees and employers. Only by this alliance, ergonomics will contribute in increasing productivity, and decreasing time loss leading to the maintenance of healthy individuals.

**Keywords:** *Ergonomics, Physical Therapy, Posture, Pain, Office, Musculoskeletal*

## Introduction

Recent data has shown increasing rates of musculoskeletal disorders amongst the working community <sup>[1]</sup>. Such disturbances include, but are not limited to, carpal tunnel syndrome, tendonitis at different levels of the body, low back pain, and neck pain <sup>[2,3,4]</sup>. These health-related complications are considered to be amongst the leading causes for disability within the modern workplace and would normally begin with discomfort, pain or injuries <sup>[5]</sup>. Many of these complications can be caused by a workstation that is improperly set-up or occupied.

Even with its genesis of confined motion nature, office-based work has no exception of having occupational risk factors in the development of physical injuries <sup>[6]</sup>. Thus, there is an assertiveness on balancing between dynamic activities and performing office-work tasks <sup>[7]</sup>. With workers experiencing concurrent occupation of workstations, it is clear that this affects their task achievements and productivity, not to mention the associated increase of expenses cost; if the work environment, in which these office workers spend the majority of their working day, is not properly designed <sup>[8,9]</sup>. Ergonomics seeks to prevent and reduce such deficiencies along with their associated health-care costs by studying the relationship between the workplace and

workers, in order to improve comfort and overall efficiency; as it has been proven that practicing good ergonomics increases productivity, improves health and safety, and raises job satisfaction of workers [9].

## Objective

It has been scientifically acknowledged that physiological pain can generate injuries, which may lead to disability and limitation of one's normal activities, if not properly addressed in a timely manner [10,11]. The purpose of this research was to study and evaluate office work-related pain and injuries; by analyzing proper versus improper ergonomics techniques of the office workers postures during their duty hours. This scope was set due to the paucity of research studies on the population of office workers in Saudi Arabia.

## Methodology

In order for this research study to successfully achieve its objective, the current situation of office ergonomics and practices must be defined. Also, the relationship between the office space and workers' health are to be determined. Therefore, surveying a random sample representing the office workers population in Saudi Arabia was the method of interest for the prosperity of this research study. The details of this method was as follows:

### The Survey (Questionnaire)

A sample of one thousand and five randomly selected individuals representing the population of office workers in Saudi Arabia was electronically surveyed by a thirty items questionnaire. This questionnaire was designed to survey the ergonomics of the participants workplace; focusing on sitting posture practice based on three main sections:

**Section A:** This section was employed to collect the required data on occupational and demographic variables as well as the data related to the prevalence of musculoskeletal disorders. Personal work related profile information (sex, age, educational level, nature of work, segment of work, height and current weight, time spend sitting) and personal health related information (physical fitness, and medical history of relevance) were the contents of this section.

**Section B:** This section was designed to identify the symptom(s) of musculoskeletal disorders experienced by the participants. The symptoms of focus were: pain in the neck, shoulder, elbow, arm & wrist, scapula & mid back, lower back, pelvis & hip, knee, and/or ankle & foot. This was formulated for the purpose of detecting the correlation between sitting body posture practices and present muscular pain.

**Section C:** This section was developed to reveal the current workstation design ergonomics, and sitting posture practices. It was employed to conclude the individuals' current sitting practices, and the employers' interest in providing healthy work environments.

The questions in these three sections were analyzed to identify whether there is a correlation between office ergonomics, type of pain, and therapy progress among those who suffer from muscular disorders despite being physical therapy beneficiaries.

## Procedures

### Subjects of Survey

One-thousand and five individuals participated in answering this study's questionnaire, where 45% of the participants were female. Out of the total participants, nine hundred and eighty-six were included in the study, as they were able to fully respond and their answers were found to be consistent. 82.75% of the total number of participants had no known chronic illness. Demographic Data of the participants is shown in (Table 1).

**Table 1: Demographic data of the participants**

Demographic	Gender	
	Male	Female
Average Age	29-34	24-28
Average Height	170.42	161.77
Average Weight	79.89	66.37
Average Body Mass Index	27.44	25.26

## Data Analysis

Statistical analysis involved the calculation of means and standard deviations, where applicable. Due to the type of data collected, The Mann-Whitney test was used for group comparisons, Spearman's correlation was used to identify any relationships between the variables, Paired t-test was used to determine whether the difference between two means is statistically significant, and Chi Square testing was also used for identifying associations (as needed). Statistical analysis was performed using PASW Statistics version 18.0.0 (2009) (SPSS, Inc., Chicago, IL), and Microsoft Excel 2010 (Microsoft, Redmond, WA). The level of significance was set to  $p \leq 0.05$ .

## Results

After analyzing the survey responses, the following correlations were evaluated:

### 1. Sitting Hours Per Day and Muscular Related Pain

The relationship between the number of sitting hours from 1 to 6 hours vs. more than 6 hours, in accordance with musculoskeletal pain experienced (pain vs. no pain) was analyzed. The results indicated that a statistical significant relationship was apparent with direct proportion, where more hours spent sitting increased the possibility of muscular pain. To be more specific, the hours spent sitting per day, had a significant relationship with neck pain ( $p=0.007$ ), shoulder pain ( $p=0.010$ ), and arm & wrist pain ( $p=0.001$ ). (These correlations were concluded using Mann-Whitney test).

### 2. No Pain and Workstation Ergonomics

At the time of the study, only 22.2% of the participants cited pain-free. There were highly significant relationships between no pain and:

- Feet fully supported ( $p=0.016$ )
- Sitting without feeling pressure on the back of the knees ( $p=0.010$ )
- Keyboard and mouse at elbow height ( $p=0.002$ )
- Wrist and upper arm relaxed when using keyboard and mouse ( $p=0.000$ )
- Mouse and keyboard at the same level and close together ( $p=0.023$ )

This confirms that, if these five ergonomic posture points are properly administered and applied, the possibility of having muscular pain from sitting, will be greatly decreased.

### 3. Neck Pain and Workstation Ergonomics

Almost 35.5% of the participants had experienced, till the time of the study, some sort of neck pain. This type of pain had significant relationships with:

- a) Feet not fully supported ( $p=0.005$ )
- b) Sitting without feeling pressure on the back of the knees ( $p=0.002$ )
- c) Keyboard and mouse not at elbow height ( $p=0.046$ )
- d) Wrist and upper arm not relaxed when using keyboard and mouse ( $p=0.000$ )
- e) No regular eye breaks from looking at the monitor ( $p=0.016$ )

### 4. Shoulder Pain and Workstation Ergonomics

Approximately 31.5% experienced shoulder pain, till the time of the study. There were highly significant relationships between shoulder pain and:

- a) Feet not fully supported ( $p=0.001$ )
- b) Wrist and upper arm not relaxed when using keyboard and mouse ( $p=0.000$ )
- c) No regular eye breaks from looking at the monitor ( $p=0.015$ )

### 5. Elbow Pain and Workstation Ergonomics

Only 3.3% of the participants had experienced elbow pain, making this type of pain the least reported. The significant relationships with this type of pain were with:

- a) Feet not fully supported ( $p=0.048$ ), and
- b) Wrist and upper arm not relaxed when using keyboard and mouse ( $p=0.025$ )

### 6. Arm & Wrist Pain and Workstation Ergonomics

Arm and wrist pain was not one of the most frequently reported types of pain, as only 10.9% of the participants complained from it. This type of pain had highly significant relationships with only:

- a) Not able to adjust the height and back of the chair ( $p=0.010$ )
- b) Wrist and upper arm not relaxed when using keyboard and mouse ( $p=0.000$ )

### 7. Scapula & Thoracic Pain and Workstation Ergonomics

There were 21.3% of the participants, whom had reported thoracic region pain. Significant relationships were found between thoracic region pain and:

- a) Feet not fully supported ( $p=0.001$ )
- b) Sitting without feeling pressure on the back of the knees ( $p=0.003$ )
- c) Keyboard and mouse not at elbow height ( $p=0.016$ )
- d) Wrist and upper arm not relaxed when using keyboard and mouse ( $p=0.003$ )
- e) Monitor positioned at least an arm's length ( $p=0.041$ )
- f) No regular eye breaks from looking at the monitor ( $p=0.001$ )

### 8. Low Back Pain and Workstation Ergonomics

This pain was the highest frequently reported pain within the participants throughout the whole study. Approximately 42% of the participants had experienced low back pain at some time in their life. It was concluded, that the significant relationships of this pain were with:

- a) Sitting without feeling pressure on the back of the knees ( $p=0.001$ )
- b) Keyboard and mouse not at elbow height ( $p=0.031$ )
- c) Wrist and upper arms not relaxed when using keyboard and mouse ( $p=0.000$ )
- d) Monitor positioned at least an arm's length ( $p=0.038$ )

### 9. Pelvis & Hip Pain and Workstation Ergonomics

In regards to pelvic region pain, not many of the participants complained from it. Only 7% of them had experienced this type of pain. It was only related to lower limb ergonomic incompatibilities. The significant relationships of pelvic region pain were only with:

- a) Feet not fully supported ( $p=0.002$ ), and
- b) Sitting without feeling pressure on the back of the knees ( $p=0.003$ )

### 10. Ankle & Foot Pain and Workstation Ergonomics

The participants that reported ankle and foot region pain were 14.3%. There were significant relationships between this type of pain and:

- a) Wrist and upper arms not relaxed when using mouse and keyboard ( $p=0.003$ )
- b) Feet not fully supported ( $p=0.014$ )
- c) Keyboard and mouse not at elbow height ( $p=0.047$ )
- d) Not able to adjust the height and back of the chair ( $p=0.000$ )

## Discussion

Due to the absence of objective measures of pain, "Patient reports are necessarily the primary source of estimates of pain prevalence and severity" [12]. Therefore, the pain severity level in this study's survey was to be estimated by the participant on a scale from zero to five; where zero and five represented no pain and worst pain possible, respectively. Also, the progress percentage of physical therapy, if any, was to be reported subjectively by the participant; in attempt to harmonically relate the physical therapy treatment to the continuous suffering of the musculoskeletal disorder.

This study revealed that over 77% of the participants had experienced musculoskeletal pain during their lifetime, in connection to their work environments. This strongly suggest that the majority of Saudi work environments are neglecting the human factors principals. Furthermore, it was obviously noted that most of these muscular pains were focused around the spinal region (lumbar, neck, thoracic and shoulder); which makes a lot of sense from the biomechanics science aspect [13] (Figure 1).

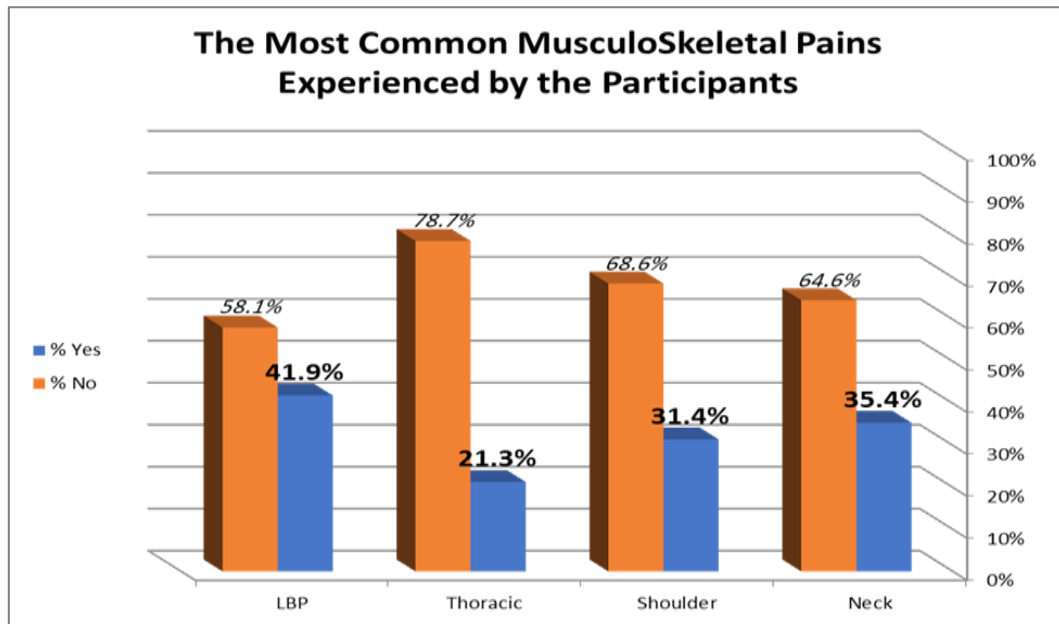


Fig. 1: Common Pain Experienced by Participants (%)

From the participants whom experienced some sort of pain, only 30% visited a physical therapy clinic. Out of those individuals who sought physical therapy assistance regarding their complaints, only 39% reported benefiting from the received treatment. The rest of the participants whom reported not benefiting from physical therapy treatment, were found to have awkward workstation ergonomics. This suggests that there is decreased awareness of the benefits of physical therapy in the working population. Al-Shehri M. et. al., have suggested similar findings, stating that there is not enough knowledge and awareness regarding physical therapy services, not only at the patients level, but also at the physicians level, leading to decreased referral's to physical therapy in Saudi Arabia [14]. It was also affirmed that one of the reasons leading to decreased numbers of physical therapy clinic visits, was the fact that physical therapy cannot be easily and directly accessed in Saudi Arabia, as is the case in other countries (e.g.: United states, United Kingdom) [14]. Information from our study also indicates that postural and recurrent habits had a large impact, and interfered with the treatment course, leading to decreased benefits of the received services.

As it was logically expected, lumbar region pain (low back pain) was the most commonly reported pain in relation with the rest of the body regions (42%). This was followed by neck region pain (35.5%). Many factors were highly correlated with both of these types of pains, where the awkward positioning of the upper or lower limbs played a major role. According to Sjogren T. et al., "Pain symptoms are a major work-related health problem in many countries, where the most common complaints focused on neck, and low back pains" [15]. Also, Ostergren P. et al., supported these findings, they concluded that work related musculoskeletal disorders and complaints constitute an important health problem in many countries, where they account for a large number of lost working days, and considerable workers compensation and disability payments [16]. Even though, low back pain has been the dominant problem for a long time, pain from the shoulder and neck region seem to occur more frequently nowadays, because of the extended office hours and awkward postures [16], as was seen in our investigation. This obviously leads to great individual suffering, and a high economic burden for the society, as this type of pain often reoccurs, and up to 10% of the individuals that suffer from these types of pains cannot continue their work [7].

## Limitations

Because this research study was a survey, it could not eliminate some uncontrollable factors. Also, regarding the physical therapy visits; the types of treatments given, and duration of the treatment sessions were not included, which could have added extra value to this investigation.

## Conclusion

In conclusion, raising the awareness of the population regarding the importance of workplace ergonomics is proposed; after highlighting the risks of awkward and improper sitting postures. Also, visiting a physical therapist during minor pain episodes, is a necessary approach, before the pain becomes chronic and causes disability. It is worth mentioning, that the appropriate employment of office ergonomics requires the cooperation of both; employees and employers. By this alliance, ergonomics will contribute in increasing productivity, and decreasing time loss leading to the maintenance of healthy individuals, and maximizing organizations profits.

## Ethics approval and consent to participate

Consent from the participants was taken online, prior to commencing the 30 item questionnaire.

## Conflicts of Interest

"The authors declare that there is no conflict of interest regarding the publication of this paper".

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## Authors' contributions

HA analysed and interpreted the data, and was a major contributor in writing the manuscript. HB was the main organizer and distributor of the questionnaire. All authors read and approved the final manuscript.

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