RELATIONSHIP BETWEEN PHYSICAL ACTIVITY LEVEL AND MUSCULOSKELETAL DISORDERS AMONG NON-ACADEMIC OFFICE WORKERS IN THE SCHOOL OF BASIC MEDICAL SCIENCES, UNIBEN.

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CERTIFICATION

This dissertation by Afegbua Omoneshiorome Abdulrazak is accepted in its present form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences of the University of Benin.

MR EGUAGIE OKHUAHESUYI ……...**……**

SUPERVISOR **SIGNATURE AND DATE**

…...…… **…...……...**

EXTERNAL EXAMINER **SIGNATURE AND DATE**

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DEDICATION

This dissertation is dedicated to God Almighty, whose grace and guidance preserved me throughout this journey. To my late mother, whose memory continues to inspire me, and to my loving father, as well as my wonderful brothers and sisters-your unwavering love and support have been my greatest source of strength. Thank you for always being there for me.

ABSTRACT

Background: Musculoskeletal disorders (MSDs) are common among sedentary office workers. This study examined the correlation between physical activity levels and MSDs among non-academic staff in the school of Basic Medical Sciences, UNIBEN.

Materials and Methods: A cross-sectional study was conducted involving non-academic staff from the Departments of Physiotherapy, Radiography, Nursing, and Medical Laboratory Science at UNIBEN. Data were collected using a structured questionnaire comprising the Extended Nordic Musculoskeletal Questionnaire (NMQ-E) and the International Physical Activity Questionnaire (IPAQ-Short Form). Chi-square tests assessed the associations between physical activity levels and the prevalence of MSDs.

Results: A cross-sectional study involving 25 non-academic staff members at UNIBEN examined the relationship between physical activity and musculoskeletal disorders (MSDs). The majority of participants were female (16, 64%), with ages ranging from 30 to 59 years (mean: 43.36 ± 8.06). All participants reported experiencing musculoskeletal pain in various body regions, with neck pain being the most prevalent. Specifically, 18 respondents reported neck pain in the 12-month prevalence (72%), and 15 reported it in the 7-day prevalence (60%). While 52% (13) of participants had high physical activity levels, no significant relationship was found between physical activity levels and 12-month MSD prevalence. However, higher physical activity levels were associated with an increased 7-day prevalence of upper back pain (X^2=6.851, p=0.033). Job roles were not linked to 12-month MSD prevalence, but shoulder and hip pain showed significant associations with specific job roles over the past 7 days.

Conclusion: This study found a high MSD prevalence, with neck pain being the most common. Physical activity was not related to long-term MSDs but correlated with upper back pain. Job roles were associated with shoulder and hip pain, highlighting the impact of ergonomic design.

Keywords: Musculoskeletal disorders (MSDs), physical activity, sedentary behavior, university of Benin.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

Musculoskeletal disorders (MSDs) are injuries or dysfunctions affecting muscles, ligaments, joints, bones, nerves, and spinal discs, often presenting symptoms such as pain, joint stiffness, tingling, numbness, reduced mobility, and functional impairment (Grabara, 2023). Musculoskeletal disorders can be categorized based on their duration, localization, and causes. Acute disorders arise suddenly and last a short time, while chronic disorders develop gradually and persist. Symptoms can be localized to a specific area or generalized. Causes of MSDs may be primary, originating from direct injury or condition, or secondary, arising from underlying health issues or external factors (Grabara, 2023). These disorders are notably prevalent in occupations involving prolonged sitting or repetitive tasks without adequate movement breaks.

Research has established a clear link between sedentary behavior and increased MSD risks, highlighting the need for regular physical activity breaks and ergonomic improvements in workplaces. Evidence suggests that office workers who incorporate physical activity into their routines experience fewer musculoskeletal symptoms, demonstrating its preventive impact (Yüzügüllü, 2023). Regular physical activity not only supports work requirements but also enhances the quality of life for workers, regardless of age (Grabara, 2023).

A notable study conducted by Archipe Mohamadou Tami et al. (2021) investigated the epidemiology of MSDs among teaching staff at the University of Douala, Cameroon. This research highlighted a significant association between MSDs and factors such as age, marital status, and job seniority, with older age groups and those with higher job seniority reporting higher incidences

of MSDs. Interestingly, physical activity was not significantly associated with MSD prevalence in this study, suggesting other underlying factors might contribute to the high rates observed. The study recommended enhancing ergonomic practices and increasing awareness among staff to address these issues (Tami et al., 2021).

Expanding on this, Fatudimu et al. (2022) in their study of a Nigerian university found a high prevalence of work-related musculoskeletal disorders (WRMSDs) among academic staff. The study observed patterns of WRMSDs related to age, job cadre, and workstation ergonomics, noting that senior staff and older individuals experienced higher rates of MSDs. This could be attributed to increased job responsibilities and age-related physiological changes. A significant contributor to the high prevalence of MSDs observed was the lack of ergonomic awareness and improper workstation setups.

The World Health Organization defines physical activity (PA) as “any bodily movement produced by skeletal muscles that requires energy expenditure,” encompassing exercise and other movement-based activities such as playing, working, active transportation, house chores, and recreational pursuits (Booth et al., 2021). Compliance with physical activity guidelines among computer workers was found to be linked to reduced musculoskeletal symptoms, underlining its importance in maintaining musculoskeletal health and preventing work-related disorders (Moreira et al., 2021).

Physical inactivity is a known risk factor for MSDs, yet some studies, including those conducted during the COVID-19 pandemic, have shown mixed results regarding its impact on MSDs among university teachers. While one study found a low rate of physically active participants and associated this inactivity with higher MSD prevalence, others reported no significant relationship

between physical activity and MSDs (Tami et al., 2021). This discrepancy underscores the importance of understanding the multifaceted nature of MSDs and the role of physical activity in mitigating these conditions.

Global studies on office workers also reveal noteworthy findings. In Poland, research by the Social Insurance Institution (ZUS) identified MSDs as the third most common cause of work incapacity (Grabara, 2023). Similarly, research on Italian white-collar employees by Amatori et al. (2024) found that increased physical activity is associated with lower MSD prevalence, reduced burnout, and improved work engagement, indicating benefits for both physical and mental health, as well as job satisfaction and productivity (Amatori et al., 2024). In contrast, a study in Nigeria by Okezue et al. (2020) reported that about 70% of office workers in higher education institutions experienced MSDs, particularly in the lower back, with associations to sex and employment duration (Okezue et al., 2020). Occupational health studies consistently report high MSD prevalence across various professional groups, with university staff at increased risk due to the sedentary nature of their work, involving prolonged sitting and repetitive tasks associated with teaching, research, and administrative duties (Smith et al., 2012).

Understanding the association between physical activity levels and musculoskeletal disorders is crucial for developing targeted interventions to improve the health and well-being of UNIBEN staff. Given the demanding nature of academic work, including extensive teaching, research, and administrative responsibilities, a thorough investigation into how physical activity and ergonomic practices influence MSD prevalence is essential. Implementing regular physical activity, ergonomic interventions, and workplace health programs can significantly enhance the well-being and productivity of office workers, including those at UNIBEN.

Currently, research highlights a strong relationship between physical activity and the prevention and management of musculoskeletal disorders among office workers. However, there are still gaps in the literature, particularly regarding studies investigating the prevalence of work-related musculoskeletal disorders (WRMSDs) in sub-Saharan Africa. This lack of data contributes to a shortage of awareness and knowledge about the effects of physical inactivity and sedentary lifestyles on musculoskeletal health in the workplace. Additionally, there is a deficiency of wellness programs specifically designed for office workers in higher education institutions to address the effects of sedentary habits and physical inactivity. This study aims to address these gaps by investigating the correlation between physical activity levels and MSDs, identifying the prevalence of work-related MSDs, associated job risk factors, and coping strategies, for non-academic office workers at UNIBEN, with a focus on the School of Basic Medical Sciences.

1.2 Statement of the Problem

The increasing prevalence of sedentary behavior among office staff has become an escalating public health concern, particularly in environments where prolonged sitting is the norm. Office workers, especially those in administrative roles, often face long hours of minimal physical activity, which can lead to a range of health issues. Studies done by Chen et al. (2022) and Grabara (2023) point out that such sedentary lifestyles are key contributors to musculoskeletal disorders (MSDs), which not only pose significant health risks but also place a considerable economic burden on both individuals and organizations.

Sedentary behavior has been consistently identified as a major risk factor for MSDs, particularly in office environments where repetitive tasks and poor posture are common. Studies by Yüzügüllü et al. (2023) and Grabara (2023) emphasize the importance of regular physical activi-

ty in mitigating these risks. Moreover, research by Moreira et al. (2021) highlights the crucial role of proper ergonomics in reducing MSD prevalence, underscoring the need for workplace adjustments to prevent the long-term effects of sustained sitting and repetitive motion.

Despite the growing body of evidence supporting the benefits of physical activity and ergonomic interventions, there is a noticeable gap in targeted workplace initiatives aimed at addressing these issues. Particularly in academic settings like the University of Benin, empirical studies exploring the relationship between physical activity levels and MSDs among non-academic staff remain scarce. Amatori et al. (2024) emphasize that without tailored interventions, such as workplace health programs, staff may continue to experience ongoing health challenges, leading to reduced productivity and escalating healthcare costs.

This study seeks to bridge this gap by investigating the correlation between physical activity levels and the prevalence of musculoskeletal disorders among non-academic office staff in the School of Basic Medical Sciences at the University of Benin. By focusing on this specific population, the research aims to provide valuable insights into the potential benefits of workplace interventions and contribute to the development of more effective strategies for improving staff health and well-being.

1.3 Research Questions

i. What is the relationship between the level of physical activity and the occurrence of MSDs among the non-academic office workers at the School of Basic Medical Sciences, UNIBEN?

ii. What is the relationship between non-academic job roles and the prevalence of MSDs among staff in the School of Basic Medical Sciences UNIBEN?

iii. What is the relationship between levels of physical activity and the prevalence of specific types of MSDs among non-academic office workers in the School of Basic Medical Sciences, UNIBEN?

iv. What is the relationship between levels of physical activity and the prevalence of specific types of MSDs among non-academic office workers in the School of Basic Medical Sciences?

1.4 Aim of the Study

This research aimed to assess and measure the correlation between physical activity levels and MSDs among non-academic office workers at the School of Basic Medical Sciences, in the department of Physiotherapy, Radiography, Nursing, and Medical Laboratory Science, UNIBEN.

1.4.1 Specific Objectives

i. Determine the relationship between physical activity and MSDs among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

ii. Determine whether specific non-academic office-based job roles at the School of Basic Medical Sciences, UNIBEN are associated with a higher prevalence of MSDs.

iii. Determine the specific regions of the body that are most prone to developing MSDs and the structures affected.

iv. To develop recommendations for balancing physical activity and sedentary behavior to reduce the incidence of MSDs.

1.5 Hypotheses

1.5.1 Main Hypotheses

i. There would be no significant association between physical activity levels and MSDs among non-academic office workers in the selected Departments of the School of Basic Medical Sciences, UNIBEN.

1.5.2 Sub Hypotheses

i. There would be no significant relationship between non-academic job roles and the prevalence of MSDs at the School of Basic Medical Sciences, UNIBEN

ii. There would be no significant relationship between physical activity level and the 12-month prevalence of neck pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

iii. There would be no significant relationship between physical activity level and the 12-month prevalence of shoulder pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

iv. There would be no significant relationship between physical activity level and the 12-month prevalence of upper back pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

v. There would be no significant relationship between physical activity level and the 12-month prevalence of low back pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

vi. There would be no significant relationship between physical activity level and the 12-month prevalence of elbow pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

vii. There would be no significant relationship between physical activity level and the 12-month prevalence of wrist pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

viii. There would be no significant relationship between physical activity level and the 12-month prevalence of hip pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

ix. There would be no significant relationship between physical activity level and the 12-month prevalence of knee pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

x. There would be no significant relationship between physical activity level and the 12-month prevalence of ankle pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

xi. There would be no significant relationship between physical activity level and the 7 day prevalence of neck pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

xii. There would be no significant relationship between physical activity level and the 7 day prevalence of shoulder pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

xiii. There would be no significant relationship between physical activity level and the 7 day prevalence of upper back pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

xiv. There would be no significant relationship between physical activity level and the 7 day prevalence of low back pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

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xvii. There would be no significant relationship between physical activity level and the 7 day prevalence of hip pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

xviii. There would be no significant relationship between physical activity level and the 7 day prevalence of knee pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

xix. There would be no significant relationship between physical activity level and the 7 day prevalence of ankle pain among non-academic office workers across selected departments in the School of Basic Medical Sciences, UNIBEN

1.6 Significance of the Study

This study aims to:

i. Improve the health and productivity of office workers at the school of Basic Medical Sciences by understanding the relationship between physical activity levels and MSDs.

ii. Contribute to the development of a tailored wellness program for office workers at the school of Basic Medical Sciences, UNIBEN.

iii. Offer insights into the long-term effects of sedentary habits among office workers.

iv. Fill existing gaps in literature.

v. Inform policy decisions and promote healthier work environments.

vi. Enhance the quality of life for non-academic office workers in the University of Benin.

1.7 Scope of the study

This study recruited employed non-academic office workers in the Department of Physiotherapy, Radiography, Nursing, and Medical Laboratory Science, at the school of Basic Medical Sciences, UNIBEN, as of 2024.

1.8 Limitations of the Study

I. The short data collection period limited the the study's ability to to fully represent long term experiences.

II. The small sample size reduced the diversity and representativeness of the study population.

III. Reliance on self-reported data introduced recall and social desirability biases, which may have affected accuracy.

1.9 Definition of Terms

I. Physical inactivity: The insufficient level of physical activity that does not meet recommended guidelines for health benefits, characterized by low levels of exercise or movement. (WHO, 2010)

II. Physical activity: Any bodily movement produced by skeletal muscles that requires energy expenditure, including activities such as exercise, sports, and daily chores. (Caspersen et al., 1985)

III. MSDs: Injuries or dysfunctions affecting muscles, ligaments, joints, bones, nerves, and spinal discs. (Grabara 2023)

IV. Sedentary behavior: Involves sitting or reclining with low energy expenditure, often associated with prolonged periods of inactivity and linked to adverse health outcomes. (Healy et al., 2010)

V. Ergonomic assessment: The evaluation of workplace conditions, equipment, and tasks to ensure they are designed to fit the capabilities and limitations of the workforce, aiming to prevent MSDs. (Hignett and McAtamney, 2000)

VI. Quality of Life: A multidimensional concept that encompasses an individual's physical health, psychological state, social relationships, and environmental factors, reflecting overall well-being and satisfaction with life. (CDC, 2021)

1.10 List of Abbreviations

I. WMSDs: Work-Related Musculoskeletal Disorders

II. MSDs: Musculoskeletal Disorders

III. UNIBEN: University of Benin

IV. BMS: Basic Medical Sciences

V. PA: Physical Activity

VI. WHO: World Health Organization

VII. BMI: Body Mass Index

VIII. QOL: Quality of Life

IX. HEIs: Higher Education Institution

CHAPTER TWO

LITERATURE REVIEW

2.1 Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) refer to a broad range of conditions affecting the muscles, ligaments, tendons, nerves, and bones of the body. These disorders are characterized by pain, stiffness, swelling, and impaired function in the affected areas. MSDs can significantly impact an individual's ability to perform daily activities and maintain their quality of life. (Grabara, 2023)

They are commonly categorized based on their duration, localization, and underlying causes. For instance, acute MSDs arise suddenly, often due to a specific injury or trauma. These disorders, such as acute strains, sprains, and fractures, are typically characterized by intense symptoms that are short-lived and tend to resolve with appropriate treatment and rest. (Grabara, 2023). Chronic MSDs, on the other hand, develop gradually over time, often as a result of repetitive stress or prolonged exposure to risk factors. Conditions like tendinitis, bursitis, and osteoarthritis fall into this category, marked by persistent pain and ongoing functional impairment. (Grabara, 2023)

In terms of site identification, MSDs can be either localized or generalized. Localized MSDs affect specific areas of the body, such as carpal tunnel syndrome, which impacts the wrist, or rotator cuff injuries that target the shoulder. Symptoms in these cases are confined to the affected region. (Okezue et al, 2023) Conversely, generalized MSDs involve multiple areas or the entire musculoskeletal system. Examples include fibromyalgia and generalized arthritis, which present with widespread pain and fatigue across different parts of the body (Cho et al. 2012).

2.2 Epidemiology of Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) are a pervasive issue affecting a wide range of professions globally, with the prevalence and impacted body regions varying considerably depending on the occupation (Grabara, 2023). The incidence of MSDs is strongly influenced by specific populations and work environments. For example, in office settings, a substantial proportion of workers experience some form of musculoskeletal discomfort, with reported rates ranging from 60% to 90%, influenced by both occupational and demographic factors (Yüzügüllü, 2023; Borhany et al., 2018).

Several factors contribute to the prevalence of MSDs, including age, gender, and job-specific tasks. Smith et al. (2012) found that older employees are more likely to report musculoskeletal pain, largely due to the cumulative impact of prolonged exposure to risk factors such as poor ergonomics and repetitive strain. Women, particularly those in office-based roles, tend to report higher rates of musculoskeletal pain than men, possibly due to differences in body mechanics and hormonal influences on pain perception (Alseminy, Chandrasekaran, & Bairapareddy, 2022).

Certain regions of the body are more frequently affected by MSDs, with the neck, shoulders, and lower back being the most commonly reported areas of discomfort. For instance, a study by Cho, Hwang, and Cherng (2012) revealed that over 70% of office workers who frequently use computers experience neck and shoulder pain, with a significant number also suffering from lower back discomfort. The persistent high prevalence of MSDs across various studies underscores the critical need to address ergonomic issues and promote physical activity in the workplace (Moreira et al., 2021).

In the healthcare sector, particularly among physiotherapists, work-related musculoskeletal disorders (WMSDs) are alarmingly prevalent. Up to 90% of physiotherapists report experiencing WMSDs at some point in their careers, with the lower back being the most commonly affected area (Okezue et al., 2020). Expanding on these findings, Okezue et al. (2020) examined WMSDs among office workers, especially those in higher education institutions (HEIs), and found a similarly high prevalence globally. In his study among HEI workers, Okezue et al, reported more than 51% of office workers in countries like Turkey, Brazil, Iran, and Kuwait reported lower back disorders, while neck disorders were more prevalent among office staff in countries such as China and Thailand. (Okezue et al., 2020) This variation highlights the need for region-specific and occupation-specific interventions to effectively manage and mitigate WMSDs.

In Nigeria, the situation is similarly concerning, with over 60% of office workers in HEIs experiencing WMSDs, and approximately 70% specifically reporting lower back issues. The study identified factors such as gender and duration of employment as closely associated with these disorders, underscoring the urgent need for targeted interventions (Okezue et al., 2020).

Beyond age and gender, the prevalence of MSDs varies widely across occupations and geographic regions. Occupations that involve repetitive tasks, prolonged sitting, or significant physical strain tend to have higher rates of MSDs. (Okezue et al., 2020). Geographic differences in prevalence are influenced by variations in occupational practices, lifestyle, and access to healthcare. The study by Okezue et al. (2020) also noted that MSD prevalence is generally higher in industrialized nations with more sedentary work environments compared to regions where occupations are more physically demanding.

2.3 Etiology of Musculoskeletal Disorders

The etiology of musculoskeletal disorders (MSDs) in office workers is complex and multifactorial, involving a range of contributing factors that collectively heighten the risk of developing these conditions.

Ergonomic challenges, work organization, and individual characteristics are among the primary factors influencing the onset of MSDs. Prolonged sitting, repetitive tasks, and poor posture stand out as key physical contributors, where the static nature of desk work imposes significant strain on the musculoskeletal system, gradually leading to discomfort and pain (Yüzügüllü, 2023).

Beyond these physical factors, psychosocial stressors such as job dissatisfaction, high workloads, and a lack of control over work tasks further compound the risk. These stressors not only heighten muscle tension but also impede the body's ability to recover from physical exertion, thereby exacerbating the impact of physical strain (Borhany et al., 2018). Additionally, individual characteristics like age, gender, and a history of musculoskeletal injuries also play a crucial role, with older workers and women often being more vulnerable to these disorders (Johnston et al., 2008).

Work-related musculoskeletal disorders (WMSDs) are particularly common among those engaged in repetitive tasks, such as typing or using a mouse. (Okezue et al., 2020). A 2023 study by Grabara highlights the susceptibility of office workers to conditions like back pain and carpal tunnel syndrome, which are closely linked to the repetitive actions and sustained postures characteristic of office work. The study also underscores the critical role of physical activity in either mitigating or exacerbating MSDs. Insufficient physical activity can lead to muscle weakness and poor posture, significantly increasing the risk of developing MSDs, while excessive physical ex-

ertion may result in overuse injuries, indicating the need for a balanced approach to maintaining musculoskeletal health (Grabara, 2023).

Repetitive strain on muscles, tendons, and nerves can manifest in conditions such as carpal tunnel syndrome, tendinitis, and epicondylitis. These issues are often aggravated by poor ergonomic design, such as improper placement of keyboards and mice, which forces awkward postures and intensifies the strain on the musculoskeletal system (Erdinc, 2011). This interplay of factors underscores the need for comprehensive strategies that address both the physical and psychosocial elements of office work to prevent and manage MSDs effectively.

2.4 Relevant Anatomy

The musculoskeletal system comprises bones, muscles, tendons, ligaments, and nerves, all of which are susceptible to the strains and stresses associated with office work. The spine, particularly the cervical and lumbar regions, is frequently affected by the prolonged sitting and poor posture that characterize many office environments.

2.4.1 The Cervical Spine

The cervical spine, especially in the neck area, is notably susceptible to strain because of the forward head posture frequently seen in office workers. This posture amplifies the stress on the neck muscles and can result in issues like cervical spondylosis, as discussed by Yüzügüllü in 2023. The cervical spine, consisting of seven vertebrae labeled C1 through C7, plays a crucial role in supporting the head and enabling a wide range of motion (Moore & Dalley, 2023).

The first cervical vertebra, known as the atlas, is ring-shaped and supports the skull. It lacks a body and spinous process and is characterized by anterior and posterior arches connected by lateral masses (Moore & Dalley, 2023). The second cervical vertebra, or axis, features a prominent odontoid process (dens) that projects upward and articulates with the atlas, facilitating head rotation (Moore & Dalley, 2023).

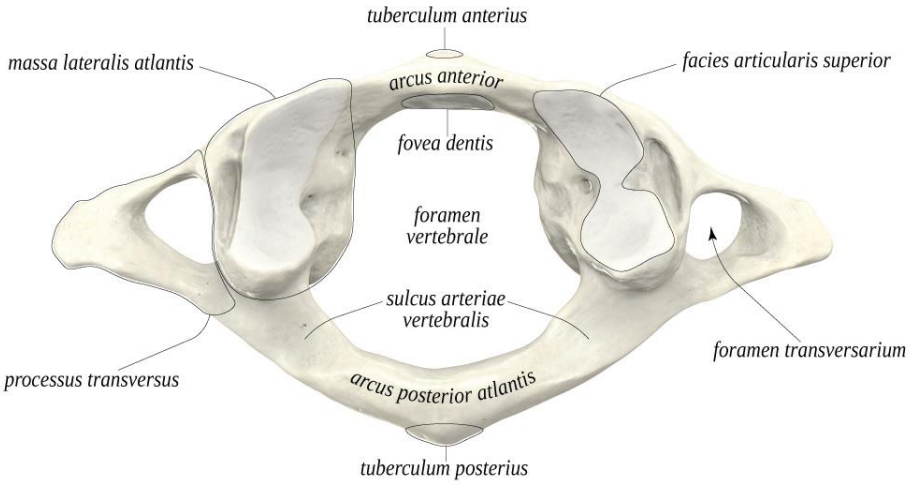

Figure 1 superior aspect of the Atlas vertebrae (C1

Vertebrae C3 through C7 exhibit a more conventional structure, including a body, pedicles, laminae, spinous processes, and transverse processes (Guyton & Hall, 2021). Each of these vertebrae has transverse foramina, openings in the transverse processes through which the vertebral arteries pass (Guyton & Hall, 2021). The spinous processes of C3 to C6 are bifid, aiding in muscle attachment and movement (Guyton & Hall, 2021).

2.4.2 Musculature of the Cervical Region.

Musculature of the cervical spine includes various muscles that support and move the neck, categorized into superficial and deep muscles.

The superficial muscles include the sternocleidomastoid (SCM) and trapezius. The SCM, being a prominent neck muscle, originates from the manubrium of the sternum and the medial portion of the clavicle and inserts into the mastoid process of the temporal bone and the superior nuchal line of the occipital bone. It primarily rotates the head to the opposite side and flexes the neck. Contraction of both SCMs flexes the neck and helps extend the head (Moore & Dalley, 2023).

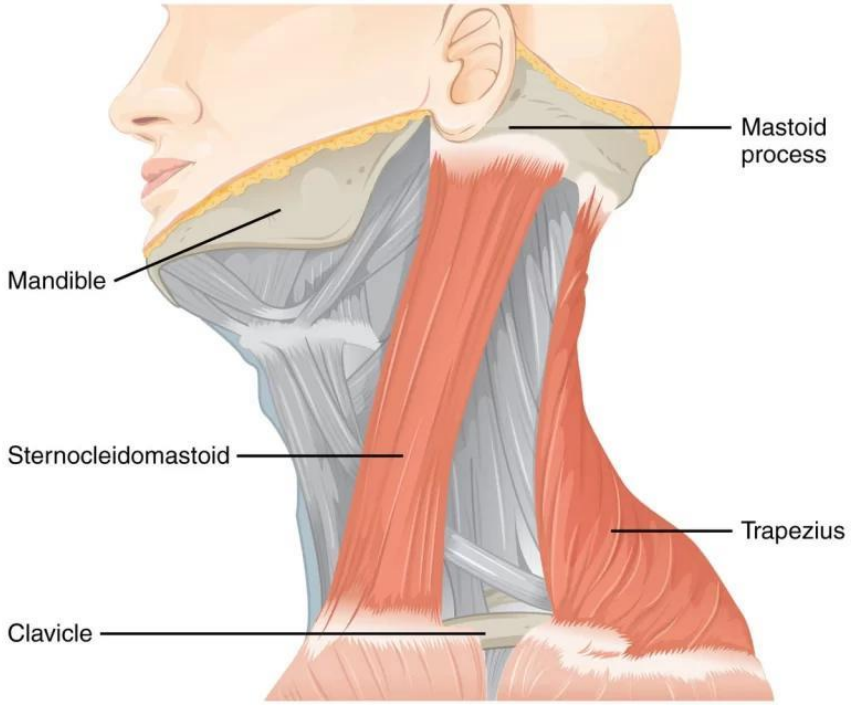

Figure 2: lateral view of the neck anatomy (adapted from

However, the trapezius is a large triangular muscle, that extends from the occipital bone and the cervical and thoracic vertebrae to the clavicle and scapula. It elevates and retracts the scapula, extends the neck, and assists in head rotation (Moore & Dalley, 2023). The deep muscles include

the splenius capitis, splenius cervicis, semispinalis capitis, semispinalis cervicis, longus colli, longus capitis, and the rectus capitis anterior and lateralis. (Moore & Dalley, 2023).

2.4.3 The Shoulder Girdle

The shoulder girdle is another area commonly affected by MSDs in office workers. The repetitive use of the arms, particularly in tasks such as typing or using a mouse, places significant strain on the shoulder muscles and tendons. This can lead to conditions such as rotator cuff tendinitis or shoulder impingement syndrome, both of which are characterized by pain and reduced range of motion (Cho, Hwang, & Cherng, 2012).

The shoulder girdle, or pectoral girdle, is a complex anatomical structure that plays a critical role in facilitating the wide range of motion necessary for upper limb function (Moore & Dalley, 2023). Comprising the clavicle, scapula, and the associated muscles, ligaments, and joints, the shoulder girdle is designed to optimize mobility while maintaining the stability required for various movements (Moore & Dalley, 2023).

2.4.4 Joints of the Shoulder Girdle

The shoulder girdle's joints are crucial for its functionality (Moore & Dalley, 2023). The sternoclavicular joint, a saddle-type synovial joint between the clavicle and the sternum, is the only bony connection between the upper limb and the axial skeleton (Moore & Dalley, 2023). It facilitates various movements of the clavicle, including elevation, depression, protraction, retraction, and axial rotation (Moore & Dalley, 2023). This joint is stabilized by a series of ligaments, including the anterior and posterior sternoclavicular ligaments, the interclavicular ligament, and the costoclavicular ligament, all of which work together to maintain joint integrity (Moore & Dalley, 2023).

Similarly, the acromioclavicular joint, a plane-type synovial joint between the clavicle and the acromion of the scapula, permits slight gliding motions that contribute to the scapula's mobility during shoulder movements (Moore & Dalley, 2023). This joint's stability is reinforced by the acromioclavicular ligament and the stronger coracoclavicular ligament, which consists of the trapezoid and conoid ligaments, ensuring that excessive movement is limited and the joint remains secure (Moore & Dalley, 2023).

The glenohumeral joint, often referred to as the shoulder joint, is a ball-and-socket synovial joint between the humerus and the scapula's glenoid cavity (Moore & Dalley, 2023). This joint allows for a wide range of motions, including flexion, extension, abduction, adduction, rotation, and circumduction (Moore & Dalley, 2023).

2.4.5 Muscles of the Shoulder Girdle

The muscles of the shoulder girdle are essential for its function and stability (Moore & Dalley, 2023).

The trapezius muscle, a large, triangular muscle, extends from the occipital bone and the spinous processes of the cervical and thoracic vertebrae to the clavicle, acromion, and spine of the scapula (Moore & Dalley, 2023). This muscle is responsible for multiple actions: its descending fibers elevate the scapula, the middle fibers retract it, and the ascending fibers depress it, allowing for a broad range of scapular movements (Moore & Dalley, 2023).

The serratus anterior, originating from the lateral surfaces of the first to ninth ribs and inserting along the medial border of the scapula, plays a critical role in protracting the scapula and holding it against the thoracic wall (Moore & Dalley, 2023). This muscle is also essential for the upward

rotation of the scapula during arm elevation, a movement necessary for reaching overhead (Moore & Dalley, 2023).

The levator scapulae, arising from the transverse processes of the first to fourth cervical vertebrae and inserting into the superior angle and medial border of the scapula, functions primarily to elevate the scapula and assist in its downward rotation (Moore & Dalley, 2023). This action is complemented by the rhomboid major and minor muscles, which originate from the upper thoracic vertebrae and insert into the medial border of the scapula (Moore & Dalley, 2023). These muscles are responsible for retracting the scapula and rotating it downward, providing stabilization against the thoracic wall (Moore & Dalley, 2023).

Additionally, the pectoralis minor muscle, which originates from the third to fifth ribs and inserts into the coracoid process of the scapula, serves to stabilize the scapula by drawing it anteriorly and inferiorly against the thoracic wall (Moore & Dalley, 2023). This action is crucial for maintaining the scapula’s position during various movements of the upper limb (Moore & Dalley, 2023).

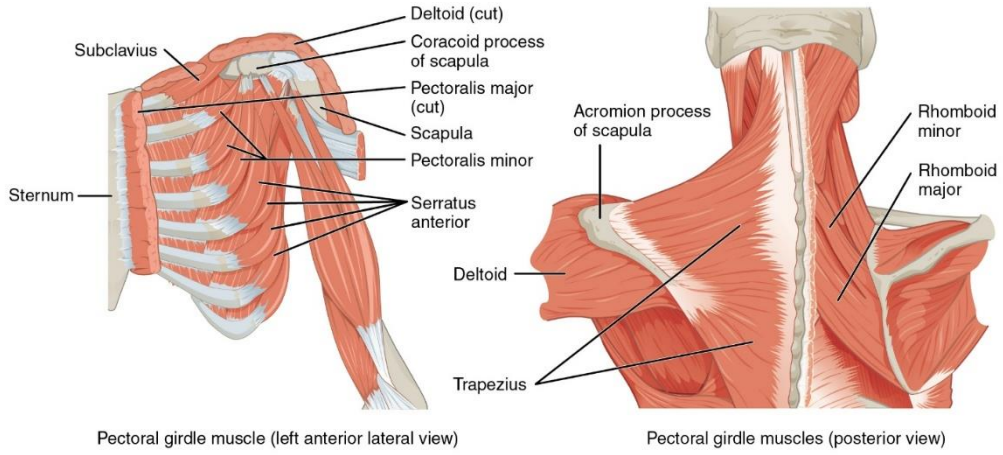

Figure 3. Left anterior lateral and posterior view of the muscles of the pectoral girdle

2.4.6 Anatomy of the Lower Back and Lumbar Vertebrae

The lower back is another common site of musculoskeletal discomfort, particularly in individuals who sit for extended periods. Prolonged sitting places increased pressure on the intervertebral discs, leading to disc degeneration and the development of conditions such as lumbar disc herniation. Poor sitting posture, characterized by slouching or leaning forward, exacerbates this pressure and increases the risk of developing lower back pain (Moreira et al., 2021).

The lower back, or lumbar region, plays a crucial role in the overall structure and function of the vertebral column. This area is composed of the lumbar vertebrae, which are uniquely adapted to bear the weight of the upper body while allowing for a wide range of movements. These vertebrae also serve as critical attachment points for various muscles and ligaments that contribute to both the stability and mobility of the spine, making them essential for maintaining posture and supporting dynamic actions such as bending, lifting, and twisting (Moore & Dalley, 2023).

2.4.7 Anatomy of the Lumbar Vertebrae

The lumbar vertebrae, comprising five individual vertebrae labeled L1 to L5, are the largest and most robust vertebrae within the spinal column. Their large, kidney-shaped bodies are specifically designed to support substantial compressive forces, providing a broad base that is essential for bearing the upper body's weight. The vertebral bodies are wider side-to-side than front-to-back, enhancing their ability to support these loads (Moore & Dalley, 2023).

Each lumbar vertebra includes a vertebral arch formed by the pedicles and laminae, which encircle the vertebral foramen. This relatively large vertebral foramen offers ample space for the spinal cord and the cauda equina, a bundle of nerve roots that extend from the lower end of the spinal cord (Moore & Dalley, 2023).

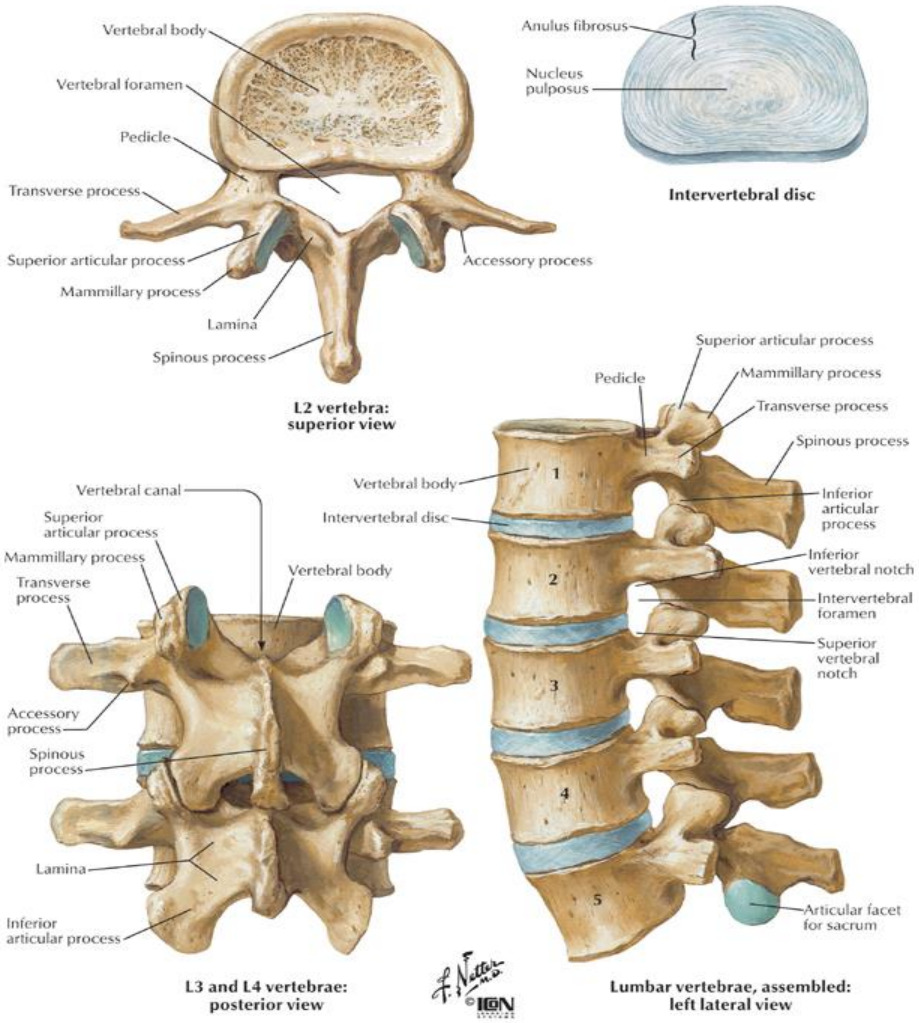

Figure 4 superior, posterior, and lateral aspect of the lumbar vertebrae (L2, L3, and L4

2.4.8 Muscles of the Lower Back

The muscles of the lower back are integral to both the movement and stabilization of the lumbar spine. The erector spinae group, which includes the iliocostalis, longissimus, and spinalis muscles, is the primary extensor of the spine and plays a vital role in maintaining an upright posture.

These muscles run longitudinally along the vertebral column and are responsible for extending and laterally flexing the spine (Moore & Dalley, 2023).

Beneath the erector spinae, lays the multifidus, a series of short, thick muscles that span between the transverse and spinous processes of the vertebrae. The multifidus plays a crucial role in stabilizing the vertebrae during movement, preventing excessive motion that could potentially damage the spinal cord or nerve roots (Moore & Dalley, 2023).

The quadratus lumborum, located in the posterior abdominal wall, significantly contributes to the lateral flexion of the lumbar spine. It also helps stabilize the lower back during various activities, such as walking or lifting. Extending from the iliac crest to the lower ribs and the transverse processes of the lumbar vertebrae, the quadratus lumborum is a key stabilizer of the lumbar region (Moore & Dalley, 2023).

2.5 Pathophysiology of Musculoskeletal Disorders

The pathophysiology of MSDs is deeply influenced by the continuous interaction between mechanical load and the body's adaptive responses over time, as highlighted in studies such as that by Moreira-Silva et al. (2016). In office environments, where tasks often involve prolonged sitting and repetitive movements, the musculoskeletal system is subjected to sustained stress. This constant mechanical loading, particularly affecting the neck, shoulders, and lower back, initiates micro trauma in the musculoskeletal tissues. Over time, as Moreira-Silva et al. (2016) discuss, these micro-injuries accumulate, leading to an inflammatory response that manifests as pain, which can progressively develop into chronic musculoskeletal conditions if the strain is not adequately managed.

Further elaborating on this, Amatori et al. (2024) explain how the static postures required in desk work contribute to muscle fatigue. The sustained tension in muscles reduces their ability to maintain proper posture, increasing the risk of discomfort that can evolve into chronic pain. Additionally, as Amatori et al. (2024) point out, prolonged sitting reduces blood flow to the muscles, leading to the accumulation of metabolic waste products, which exacerbates muscle fatigue and discomfort.

Specific conditions such as carpal tunnel syndrome provide a clear example of how repetitive movements and sustained postures contribute to MSDs, as discussed by Cho, Hwang, and Cherng (2012). Their study illustrates how repetitive wrist movements, such as those involved in typing, increase pressure within the carpal tunnel, compressing the median nerve. This nerve compression results in symptoms like pain, numbness, and weakness in the hand, underscoring the pathophysiological processes involved. Similarly, Borhany et al. (2018) highlight how tendinitis, often affecting the shoulders and elbows, results from the overuse of tendons. The repetitive strain leads to inflammation, causing pain and impairing function in the affected areas.

Thus, as evidenced by these studies, the pathophysiology of MSDs is characterized by the body's cumulative response to mechanical strain, with inadequate management leading to the development of chronic, debilitating conditions.

2.6 Clinical Presentation of MSDs

The clinical manifestations MSDs are diverse, largely depending on the specific condition and its severity. Typically, individuals with MSDs experience symptoms which can severely affect their quality of life and functional abilities.

MSDs are characterized by a range of symptoms that impact daily functioning and quality of life. Pain is the most prominent and defining symptom, often varying in intensity from mild discomfort to severe, debilitating sensations. This pain can be acute or chronic, localized or diffuse, and frequently worsens with movement or specific activities. For instance, osteoarthritis commonly exacerbates pain during weight-bearing activities but may alleviate with rest. (Okezue et al., 2020).

Joint stiffness is another prevalent symptom, particularly noticeable in conditions like rheumatoid arthritis and osteoarthritis. Stiffness is often most severe in the morning or after periods of inactivity, a phenomenon known as “morning stiffness.” This limitation in joint mobility results from inflammation or degeneration, making movement challenging. (Okezue et al., 2020).

Swelling in and around joints, muscles, or soft tissues is frequently observed due to inflammation, fluid accumulation, or tissue damage. Conditions such as rheumatoid arthritis or bursitis can cause significant swelling, which is often accompanied by warmth and redness. This swelling can lead to joint deformities and further restrict mobility.(Tami et al., 2021).

Muscle weakness is commonly associated with MSDs and can result from disuse, pain, or direct muscle involvement. Disorders like polymyositis and muscular dystrophies primarily affect the muscles, leading to progressive weakness and atrophy. This weakness impairs daily activities, such as walking, lifting objects, and maintaining posture.(Yüzügüllü, 2023).

A reduced range of motion is frequently seen in MSDs, particularly those affecting the joints or surrounding tissues. Limitations in movement can stem from pain, joint stiffness, or mechanical blockages, such as bone spur in osteoarthritis. Reduced mobility not only hampers daily activities but can also contribute to muscle atrophy and further joint deterioration. The Interplay of

pain, stiffness, swelling, and weakness often culminates in significant functional impairment. Individuals with MSDs may struggle with basic tasks such as walking, dressing, or climbing stairs. In severe cases, these disorders can lead to disability, affecting an individual's ability to work or participate in social activities. (Okezue et al., 2020).

2.7 Diagnosis of Musculoskeletal Disorders

2.7.1 Imaging Studies

X-rays are a fundamental tool in diagnosing musculoskeletal disorders, particularly for visualizing bones and identifying fractures, dislocations, and degenerative changes like osteoarthritis. However, their ability to assess soft tissues and detect early-stage degenerative conditions is limited, often necessitating additional imaging techniques for a comprehensive evaluation.

This is where Magnetic Resonance Imaging (MRI) becomes invaluable. MRI offers detailed images of both bone and soft tissues, making it particularly useful for diagnosing complex conditions such as herniated discs and ligament injuries. Despite its advantages, MRI is generally more expensive and less accessible than X-rays. Moreover, its high resolution can sometimes reveal incidental findings, which may complicate interpretation.

For cases requiring detailed cross-sectional imaging, Computed Tomography (CT) scans provide a higher level of detail than standard X-rays, particularly for evaluating complex fractures and the involvement of both bone and soft tissues. However, the increased radiation exposure associated with CT scans and their comparatively lower detail in soft tissue imaging, relative to MRI, may limit their use in certain conditions.

Complementing these imaging modalities, Ultrasound offers a real-time view of soft tissues, making it especially effective for diagnosing injuries to tendons and muscles, and for guiding procedures like injections. Nevertheless, ultrasound's ability to visualize deeper or more complex structures is limited compared to MRI and CT scans.

2.7.2 Laboratory Tests

To further support diagnosis, Blood Tests play a crucial role in identifying systemic conditions that could contribute to musculoskeletal disorders. For instance, markers like the Erythrocyte Sedimentation Rate (ESR), C - reactive protein (CRP), and Rheumatoid Factor (RF) are commonly used to detect inflammation and conditions like rheumatoid arthritis. However, these tests are often non-specific, necessitating further clinical evaluation for a definitive diagnosis.

In cases where joint conditions are suspected, Synovial Fluid Analysis can provide critical insights by examining the fluid within a joint, helping to identify conditions such as gout or infections. Despite its diagnostic value, this procedure is invasive and carries risks, including potential joint infection or irritation.

2.7.3 Functional Assessments

Once a diagnosis is established, understanding the impact of musculoskeletal disorders on a person's daily life becomes essential. Functional testing assesses this by examining how specific actions, such as lifting, walking, or climbing stairs, are affected. Tools like the Oswestry Disability Index (ODI) and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire are employed to gauge the functional limitations posed by these disorders, offering valuable insights into the practical challenges faced by individuals.

Lastly, to prevent or manage musculoskeletal disorders in the workplace, Workplace Ergonomics Assessment plays a vital role. By evaluating the work environment, identifying potential ergonomic risks, and recommending modifications, this assessment aims to create a safer and more comfortable workspace, ultimately reducing the risk of musculoskeletal disorders among employees.

2.8 General Prognosis of Musculoskeletal Disorders

2.8.1 Acute vs. Chronic MSDs

The prognosis of musculoskeletal disorders (MSDs) varies significantly depending on whether the condition is acute or chronic, with each type presenting distinct recovery patterns and management needs.

Acute MSDs are characterized by a sudden onset and typically last for a short duration, often ranging from a few days to a maximum of three months. They usually arise from sudden injuries or strains, with a favorable prognosis when managed properly. These conditions, such as sprains or muscle strains, typically result from a specific incident or overexertion, leading to immediate pain and discomfort. With appropriate interventions such as rest, targeted treatment, and rehabilitation, most individuals experience significant improvement, often recovering fully within a few weeks to a few months. The body’s natural healing processes, aided by therapeutic strategies, generally allow for a return to normal function, with the potential for complete resolution of symptoms.

In contrast, chronic MSDs develop gradually and persist beyond three months, often lasting for years or even a lifetime. They Include conditions like osteoarthritis or persistent back pain, develop gradually over time and tend to have a more variable and complex prognosis. Unlike acute

injuries, chronic MSDs are often the result of long-standing wear and tear, repetitive stress, or degenerative changes that progress slowly but steadily. These conditions are characterized by ongoing pain and functional limitations that may fluctuate in severity.

While chronic MSDs can be effectively managed with long-term strategies, such as lifestyle modifications, physical therapy, and medication, they often require continuous effort to control symptoms and prevent further deterioration. Complete recovery is less common in chronic cases, with the focus instead shifting to managing pain, maintaining mobility, and enhancing quality of life over the long term.

2.9 Management of Musculoskeletal Disorders

Managing MSDs involves a comprehensive strategy that includes medical treatment, physiotherapy, ergonomic adjustments, lifestyle changes, and psychosocial interventions.

2.9.1 Medical Management

These include:

Therapeutic Interventions: A multi-faceted approach combining medication, physical therapy, and ergonomic modifications effectively alleviates symptoms and improves function.

Pharmacological Treatments: Pain relievers, anti-inflammatory drugs, and muscle relaxants are often the first step in managing MSD symptoms, though they are typically used alongside other treatments for comprehensive care.

Ergonomic Adjustments: Modifying workstations, using supportive equipment, and promoting regular breaks are crucial for reducing strain and preventing injury, complementing medical treatments.

Education and Self-Management: Educating individuals on posture, body mechanics, and regular physical activity empowers them to manage their health proactively and prevent MSDs.

2.9.2 Surgical Interventions

When conservative treatments fail, surgical options like Arthroscopy for joint issues, Joint Replacement for severe osteoarthritis and Spinal Surgery for severe spinal disorders may be necessary to restore function and alleviate pain.

2.9.3 Ergonomic and Workplace Interventions

Workplace Modifications: Ergonomic design adjustments and the use of supportive tools help reduce physical stress and prevent MSDs.

Policy Development: Implementing ergonomic practices, regular breaks, and wellness programs, along with training on safe work practices, helps create a healthier work environment, reducing the risk of MSDs.

2.10 Physical Activity

Physical activity plays a significant role in maintaining musculoskeletal health, especially among individuals engaged in sedentary work environments like office settings. Regular physical activity is crucial in preventing musculoskeletal disorders (MSDs), which are prevalent among office workers due to prolonged sitting and repetitive movements. The lack of sufficient physical activity contributes to the development of various MSDs, including neck, shoulder, and lower back pain, as reported in several studies. Regular exercise and movement can mitigate these risks by enhancing muscle strength, flexibility, and overall physical conditioning, which are essential for

maintaining musculoskeletal integrity and reducing discomfort (Yüzügüllü, 2023; Borhany et al., 2018).

2.10.1 Factors Affecting Physical Activity

Several factors influence the level of physical activity among office workers, including workload, workplace ergonomics, and individual motivation. High workloads often result in prolonged sitting periods with minimal breaks, leading to reduced opportunities for physical activity. Poor ergonomic design of workstations can exacerbate the physical strain on the body, further discouraging movement and exercise during work hours. Additionally, individual factors such as age, gender, and personal health beliefs also play a role in determining how much physical activity an office worker engages in. For instance, younger workers may be more inclined to participate in physical activities outside of work compared to their older counterparts (Cho, Hwang, & Cherng, 2012; Moreira et al., 2021).

2.10.2 Outcome Measures for Level of Physical Activity and Musculoskeletal Disorders

Measuring the level of physical activity in relation to musculoskeletal health involves various outcome measures, and self-reported questionnaires including:

1. Tools like the International Physical Activity Questionnaire (IPAQ) which assess physical activity levels based on individual reports.
2. Assessments of musculoskeletal pain or discomfort with questionnaires like the Extended-Nordic Musculoskeletal Questionnaire (NMQ-E) which evaluates musculoskeletal pain and discomfort.

These measures help in understanding the relationship between physical activity and musculoskeletal health outcomes, identifying patterns of activity and inactivity, and assessing their correlation with the prevalence of MSDs among office workers (Moreira-Silva et al., 2016; Nguyen et al., 2021).

2.11 Core Concepts

2.11.1 Physical Activity Levels:

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. It includes exercise, recreational activities, and routine tasks. Physical activity levels are categorized based on frequency, duration, and intensity, which can significantly influence musculoskeletal health (Booth et al., 2021).

2.11.2 Musculoskeletal Disorders (MSDs):

MSDs encompass a range of conditions affecting muscles, joints, tendons, and ligaments. These disorders can be acute or chronic and are influenced by factors such as repetitive strain, prolonged static posture, and inadequate ergonomics. Symptoms include pain, stiffness, and reduced mobility, which can impact work productivity and quality of life (Grabara, 2023).

2.11.3 Ergonomics:

Ergonomics involves designing workspaces and tasks to fit the physical capabilities of the workers, thereby minimizing strain and preventing MSDs. Effective ergonomic practices include proper workstation design, adjustable furniture, and regular breaks to reduce physical stress (Moreira et al., 2021).

2.11.4 Psychosocial Factors:

Psychosocial factors, such as stress and mental health, play a crucial role in the development and management of MSDs. Stress can exacerbate physical symptoms, while poor mental health can affect an individual's ability to engage in preventive or therapeutic activities (Moreira et al., 2021).

2.12 Relationships Between Concepts

2.12.1 Physical Activity and MSDs:

Physical activity is hypothesized to reduce the risk and severity of MSDs by enhancing musculoskeletal strength, flexibility, and overall physical resilience. Regular exercise can counteract the negative effects of prolonged sitting and repetitive tasks, potentially leading to fewer MSD symptoms and better overall musculoskeletal health (Yüzügüllü, 2023; Grabara, 2023).

2.12.2 Ergonomics and MSDs:

Proper ergonomic practices are expected to prevent or reduce MSDs by minimizing physical strain during work tasks. Ergonomic adjustments, such as proper chair height, monitor positioning, and keyboard setup, help in maintaining correct posture and reducing repetitive strain injuries (Amatori et al., 2024).

2.12.3 Psychosocial Factors and MSDs:

Psychosocial factors are integrated into the framework as they influence both the occurrence and management of MSDs. Stress, job dissatisfaction, and mental health issues can aggravate physical symptoms and hinder effective management strategies. Addressing psychosocial factors

through supportive work environments and stress management programs is essential for comprehensive MSD management (Moreira et al., 2021).

2.12.4 Interaction Between Physical Activity, Ergonomics, and Psychosocial Factors

The framework posits that physical activity, ergonomic practices, and psychosocial factors interact to influence MSD prevalence and severity. For instance, inadequate ergonomics combined with high stress levels may exacerbate the impact of low physical activity, leading to a higher risk of MSDs. Conversely, improved ergonomic practices and regular physical activity may mitigate some of the negative effects of psychosocial stress on musculoskeletal health. (Moreira et al., 2021; Yüzügüllü, 2023; Grabara, 2023; Amatori et al., 2024).

2.13 Empirical Review of Literature

TABLE 1: Empirical Review of Literature

AUTHOR/YEAR	TITLE	METHODOLOGY	RESULTS	CONCLUSION
Yüzügüllü (2023)	The Impact of Physical Activity on Musculoskeletal Pain among Office Workers in Adana, Turkey	Cross-sectional study with 107 office workers in Adana, Turkey. Data were collected using face-to-face interviews, covering demographic factors, musculoskeletal disorders (via ENMSQ), and physical activity	75.7% were women; 30.8% were inactive. Common pain areas included waist (54.2%), neck (50.5%), and back (45.8%). Female gender, working without breaks, and insufficient physical activity increased the risk of musculoskeletal pain.	The results of the study indicated that neck and low back pain are prevalent among office workers, particularly among those with prolonged sitting and insufficient physical activity.
Grabara	Musculoskeletal	Cross-sectional study of 254	57% reported lower	Lower back and neck

(2023)	Disorders and Physical Activity among Teachers in Poland.	teachers in Upper Silesia, Poland. Physical activity (PA) was assessed using SDPAR, and musculoskeletal disorders (MSDs) via NMQ.	back disorders in the past 12 months. Female teachers were less likely to engage in vigorous PA. Pain intensity was negatively related to PA, and BMI negatively correlated with PA levels.	disorders were most common. Female teachers were less active than male counterparts, with pain intensity linked to lower PA levels.
Borhany et al. (2018)	Prevalence of Musculoskeletal Problems among Computer Users in Pakistan .	Cross-sectional study of 150 office workers and students in Pakistan, who used computers for at least 3 hours daily. Data were collected via an English questionnaire.	44.7% had musculoskeletal problems, primarily headache (46%) and neck pain (41.3%). Musculoskeletal issues were significantly associated with the duration of computer use.	Musculoskeletal symptoms, especially headache and neck pain, are common among frequent computer users and often go un
Okezue et al. (2020)	Work-Related Musculoskeletal Disorders among Office Workers in Higher Education Institutions .	Cross-sectional survey of 217 office workers in higher education institutions, using self-report questionnaires on WMSDs.	71.9% prevalence of WMSDs, with lower back, wrists/hands, and shoulders most affected. WMSDs were significantly associated with gender, age, work hours, and work experience.	WMSDs are prevalent, especially in the back and upper extremities, with higher risks in older, female, and more experienced workers. Effective detection and curtailment measures are needed.
Tami et al. (2021)	Prevalence of Musculoskeletal Disorders among University Teachers in Douala, Cameroon.	Cross-sectional analytical study of 92 university teachers in Douala, Cameroon. Data collected on MSD prevalence and physical activity.	High prevalence of MSDs, particularly in the neck, shoulders, and lower back. No significant association found between physical activity and MSDs.	MSDs were more common among younger, less experienced, and unmarried teachers. Public health policies should focus on prevention, especially for younger workers.
Alseminy et al. (2022)	Work-Related Musculoskeletal	Cross-sectional study of 507 young adults in the UAE.	75% prevalence of WRMSDs. No signif-	High prevalence of WRMSDs was ob-

	Disorders and Physical Activity among Young Adults in the UAE.	Survey on WRMSDs, physical activity, and quality of life.	icant association between physical activity or quality-of-life scores and WRMSDs.	served, but physical activity and quality of life were not significant determinants
Fatudimu et al. (2022)	Ergonomic Factors and Musculoskeletal Disorders among Academic Staff in Nigeria	Cross-sectional study of 202 academic staff at the University of Ibadan, Nigeria, using a stratified sampling technique. Data on MSDs were collected via the Standard Nordic Questionnaire and ROSA.	High prevalence of WMSDs, with most participants having inappropriate workstations and poor ergonomic awareness.	WMSDs are prevalent due to poor ergonomic designs. Education on ergonomics and better office furniture could reduce the risk of WMSDs.
Moreira et al. (2021)	Musculoskeletal Symptoms and Physical Activity among Computer Workers	Cross-sectional study of 119 computer workers, using the Nordic Musculoskeletal Questionnaire (NMQ) and IPAQ.	MSS were common in the lumbar region (56.3%), neck (43.7%), and shoulders (39.5%). Participants following WHO PA recommendations had lower MSS, though differences were not statistically significant.	Computer workers had high MSS frequency, with lower reports among those following PA guidelines. This finding highlights the importance of promoting health-oriented PA programs.
Amatori et al. (2024)	The Relationship between Physical Activity, Musculoskeletal Disorders, Burnout, and Work Engagement among Italian Employees.	Cross-sectional study of 615 Italian white-collar employees, assessing PA, MSDs, burnout, and work engagement.	36.9% did not meet PA guidelines; 44.1% exceeded them. Exceeding PA guidelines was associated with fewer MSDs, better mental health, and higher work engagement.	PA positively affects physical and mental health, especially when performed at high levels. Workplaces should encourage health-focused interventions.
Cho et al. (2012)	Musculoskeletal Symptoms and Risk Factors among Computer Users in Taiwan.	Cross-sectional study of 203 computer users in Taiwan, using questionnaires to assess musculoskeletal symptoms and risk factors.	Shoulder (73%), neck (71%), and upper back (60%) were the most common pain areas. High psychological distress was associated with	High workload computer use is linked to musculoskeletal symptoms, particularly in the shoulder, neck, and upper back regions, exacerbated

			shoulder and upper back complaints.	by psychological distress.
Jahanbin et al. (2022)	Ergonomic Factors, Physical Activity, and Musculoskeletal Symptoms among Iranian Office Workers.	Cross-sectional study of 420 Iranian office workers, assessing the relationship between ergonomic factors, musculoskeletal symptoms, and physical activity.	High prevalence of musculoskeletal symptoms, with lower back, neck, and shoulder pain being most common. Poor ergonomics and low physical activity were significant risk factors.	Musculoskeletal symptoms are prevalent due to poor ergonomics and low physical activity, highlighting the need for ergonomic interventions and PA promotion.
Zengin et al. (2023)	Musculoskeletal Disorders and Physical Activity Levels among Turkish Office Workers.	Cross-sectional study of 256 Turkish office workers, evaluating musculoskeletal disorders and physical activity levels.	68% had musculoskeletal disorders, with lower back and neck pain most common. Low physical activity was associated with increased musculoskeletal symptoms.	High prevalence of musculoskeletal disorders among office workers, with low physical activity contributing to increased risk.
Fuentes et al. (2021)	Prevalence and Determinants of Musculoskeletal Disorders among Office Workers in Chile	Cross-sectional study of 310 Chilean office workers, investigating the prevalence of musculoskeletal disorders and their relationship with physical activity.	72% had musculoskeletal disorders, with the neck, lower back, and shoulders most affected. Low physical activity was associated with higher prevalence of musculoskeletal disorders.	Musculoskeletal disorders are prevalent among office workers, with low physical activity being a significant risk factor.
Nguyen et al. (2023)	Ergonomics, Physical Activity, and Musculoskeletal Symptoms among Vietnamese Office Workers.	Cross-sectional study of 480 Vietnamese office workers, exploring musculoskeletal symptoms and their association with ergonomic factors and physical activity.	74% reported musculoskeletal symptoms, with lower back and neck pain most common. Poor ergonomics and low physical activity were significant contributors	High prevalence of musculoskeletal symptoms is linked to poor ergonomics and low physical activity, emphasizing the need for ergonomic improvements and PA promotion.

Kim et al. (2022)	Musculoskeletal Disorders and Physical Activity among Office Workers in South Korea	Cross-sectional study of 530 South Korean office workers, examining musculoskeletal disorders and their relationship with physical activity levels.	70% reported musculoskeletal disorders, with the neck, lower back, and shoulders most affected. Low physical activity was significantly associated with higher prevalence of disorders.	Musculoskeletal disorders are common among office workers, with low physical activity increasing the risk. Promoting PA is essential for reducing the prevalence of these disorders.

CHAPTER THREE

METHODS

3.1 Participants

Participants for this study will be male and female individuals aged 18 years and above working as non-academic office workers in the school of basic medical sciences UNIBEN.

3.1.1 Inclusion Criteria

Participants included non-academic office workers from the school of Basic Medical Sciences at UNIBEN who were:

i. From the Department of Physiotherapy, Radiography, Nursing, and Medical Laboratory Science.
ii. Over the age of 18.
iii. Employed full-time within the faculty.
iv. Able to provide informed consent to participate in the study.

3.1.2 Exclusion Criteria

Participants were excluded if they:

I. Had any obvious physical deformity like Genu Valgus, Genu Recurvatum, etc..
II. Had any self-reported injury sustained due to falls, trauma, or road traffic accident.

3.2 Materials

3.2.2 Apparatus/Instruments

The following tools were used for data collection:

I. International Physical Activity Questionnaire (IPAQ):

This is a widely used tool designed to measure physical activity levels among individuals aged 15 to 69 years across different populations. It was developed to provide a standardized method for assessing physical activity in large-scale studies internationally. The questionnaire comes in two versions: the short form (IPAQ-SF), which focuses on total weekly physical activity, and the long form (IPAQ-LF), which provides a detailed breakdown of activities in four domains (work, transport, domestic, and leisure). (Sallis, 2010)

The IPAQ measures activities across different intensities: vigorous, moderate, and walking. It also captures sedentary behavior, which is important in assessing physical inactivity. The output is typically calculated in MET-minutes/week, allowing researchers to quantify energy expenditure based on metabolic equivalents (METs). Validity studies have shown that the IPAQ can reliably categorize individuals into low, moderate, or high levels of physical activity, though it tends to slightly overestimate activity levels compared to objective measures like accelerometers (Craig et al., 2003; Lee et al., 2011).

Several validation studies have been conducted to assess the reliability and validity of the IPAQ in various populations. For example, a study in the United Kingdom confirmed that the IPAQ (long form) is a valid tool for assessing moderate to vigorous physical activity among older adults, though there were some discrepancies between self-reported and objective measurements,

like those obtained through accelerometers (BMC Medical Research Methodology, 2020). Despite this, the IPAQ remains a practical tool for epidemiological studies due to its ease of use and cost-effectiveness (Craig et al., 2003).

The IPAQ-SF is ideal for this study because it quickly assesses PA levels, including sedentary behavior, which is crucial for understanding MSD risks among office workers. Its global standardization ensures reliable data collection and comparability.

II. Extended-Nordic Musculoskeletal Questionnaire (NMQ):

This is a specialized tool used to assess musculoskeletal symptoms across different body regions, including the neck, shoulders, back, elbows, wrists, hips, knees, and ankles. The NMQ-E extends the original Nordic Musculoskeletal Questionnaire (NMQ) by providing more detailed questions about the frequency, duration, and impact of musculoskeletal pain or discomfort.

The NMQ-E has been used extensively in occupational health research to identify the prevalence of musculoskeletal disorders (MSDs) in various work environments. It asks participants about discomfort experienced in the past 7 days and 12 months, enabling researchers to track acute and chronic symptoms. Studies have found the NMQ-E to be a reliable tool for identifying risk factors related to work-related musculoskeletal disorders (Dickinson et al., 1992; Crawford, 2007).

For example, a study in Cameroon using the NMQ-E highlighted a high prevalence of musculoskeletal pain among university teaching staff, linking it to factors such as age, work posture, and prolonged sitting (Tami et al., 2021). Similarly, the NMQ-E was used in a study of healthcare workers to monitor the development of MSDs in relation to their physical workload and work

environment (Smith et al., 2012). This questionnaire's structured format makes it ideal for cross-sectional studies in both clinical and occupational settings.

3.3 Methods

3.3.1 Research Design

This study employed a cross-sectional research design to investigate the relationship between physical activity levels and musculoskeletal disorders among staff. This design facilitated the assessment of physical activity and musculoskeletal health simultaneously at a single point in time.

3.3.2 Sampling Technique/Sample Size Calculation

A purposive sampling technique was used to ensure representation across different selected departments within the faculty.

The sample size for this study will be calculated using the Taro Yamane formula:

$n=N/(1+N(e)^2)$

Where n=sample size, N=population size, e=margin of error (set at 0.05)

3.3.3 Procedure for Data Collection

The research process will be unfolding in several steps. First, ethical approval will be obtained from the Ethics and Research Committee at the University of Benin, ensuring compliance with ethical standards. Following this, the recruitment process will be designed to accommodate various preferences and ensure broad participation, utilizing both direct in-person interactions and verbal communication. Once participants are recruited, informed consent will be acquired from all individuals, ensuring they are fully informed about the study's purpose and their involvement.

Subsequently, participants will be completing the International Physical Activity Questionnaire (IPAQ) to assess their physical activity levels, alongside the Nordic Musculoskeletal Questionnaire (NMQ) to evaluate any musculoskeletal discomfort they may experience. After data collection, all data will be carefully cleaned and prepared for analysis, ensuring its accuracy and reliability before proceeding with further statistical examination.

3.3.4 Ethical Considerations

The study was conducted in accordance with ethical guidelines. Approval was obtained from the University of Benin ethics committee. Participants were assured of confidentiality, anonymity, and the right to withdraw from the study at any time without penalty. All data were anonymized and securely stored.

3.3.5 Data Analysis

Data analysis was conducted using the IBM Statistical Package for Social Sciences (SPSS, version 27.0) to explore the relationship between physical activity levels and musculoskeletal disorders. Descriptive statistics summarized demographic information and physical activity data, with means, standard deviations, and frequencies calculated to provide an overview of participant characteristics and activity levels. Correlation analysis was applied to examine the strength and direction of the relationships between physical activity levels, derived from both self-reports and objective measures, and the severity of musculoskeletal disorders. Regression analysis was then employed to assess how well physical activity levels predicted the prevalence and severity of musculoskeletal disorders. Multiple regression models controlled for potential confounding variables, determining the specific impact of physical activity on musculoskeletal outcomes. Additionally, comparative analysis compared physical activity levels and musculoskeletal discomfort

across different subgroups, such as job roles or departments, using t-tests or ANOVA to identify significant differences.

CHAPTER FOUR

RESULTS

4.1 Preamble

This study assessed the correlation between physical activity levels and MSDs among non-academic secretarial staff at the School of Basic Medical Sciences. A total of 25 participants were recruited from the Departments of Physiotherapy, Radiography, Nursing and Medical Laboratory Science, University of Benin.

4.1.1 Socio-demographic characteristics of the respondents

Among the 25 participants, the majority were female (16 respondents, 64%), while males constituted 36% (9 respondents). In terms of departmental distribution, respondents from the Nursing department made up the highest proportion (32%), followed by Physiotherapy (28%), Medical Laboratory Science (MLS) (24%), and Radiography (16%).

Regarding job roles, most respondents were administrative staff (14 respondents, 56%), while clerical staff accounted for 28% (7 respondents). Lab attendants and corpers each represented 4% (1 respondent each).

All participants used standard desks (100%) and standard chairs (100%) in their work environments.

The respondents' ages ranged from 30 to 59 years, with a mean age of 43.36 years (±8.06). The years of service spanned from 1 to 34 years, with a mean duration of 9.00 years (±6.51).

Table 2: Socio-demographic and anthropometric characteristics of the respondents (n = 25)

Variable	Frequency	Percentage
Gender		
Male	9	36
Female	16	64
Department		
Nursing	8	32
Physiotherapy	7	38
Radiography	4	16
Medical lab science	6	24
Job		
Clerical Staff	7	28
Administrative Staff	14	56
Lab Attendant(s)	1	4
Corper	1	4
Desk Type		
Standard Desk	25	100
Chair Type		
Standard Chair	25	100
	Range	**Mean ± SD**
Age	30 – 59	43.36 ± 8.06
Years of Service	1 – 34	9.00 ± 6.51

4.1.2 Prevalence of musculoskeletal pain among the respondents

Table 3 highlights the prevalence of musculoskeletal pain among the respondents over the past 12 months and 7 days.

The overall 12-month and 7-day prevalence rates were both 100%, indicating that all respondents experienced some form of musculoskeletal pain during these periods.

The neck was the most commonly affected area, with a 12-month prevalence of 72% and a 7-day prevalence of 60%. This was followed by the upper and lower back, which had 12-month prevalence of 56% each, and 7-day prevalence of 52% and 44%, respectively.

Shoulder pain was reported by 12 respondents (48%) over the past 12 months and by 10 respondents (40%) in the last 7 days. Wrist pain had a similar 12-month prevalence of 48%, but a lower 7-day prevalence of 28%.

Knee pain was reported by 10 respondents (40%) over 12 months and by 8 respondents (32%) in the past week. Ankle pain had a 12-month prevalence of 32% and a 7-day prevalence of 20%.

Hip pain was less common, with 6 respondents (24%) reporting it over the past year and 4 respondents (16%) in the last 7 days. Elbow pain was the least prevalent, with only 3 respondents (12%) reporting it over 12 months and 2 respondents (8%) in the past week.

Musculoskeletal pain significantly impacted respondents' ability to work. A total of 10 respondents (40%) reported being unable to work due to musculoskeletal disorders, while 8 (32%) had to take time off work. Additionally, 18 respondents (72%) attributed their discomfort to their workstation setup or job roles.

Table 3: Prevalence of musculoskeletal pain among the respondents

Region	Frequency (n)	Percentage (%)
Overall 12-Month prevalence	25	100
Overall 7-Day prevalence	25	100
Neck		
12-month prevalence	18	72
7-day prevalence	15	60
Shoulders		
12-month prevalence	12	48
7-day prevalence	10	40
Upper Back		
12-month prevalence	14	56
7-day prevalence	13	52
Lower Back		
12-month prevalence	14	56
7-day prevalence	11	44
Elbows		
12-month prevalence	3	12
7-day prevalence	2	8
Wrist		
12-month prevalence	12	48
7-day prevalence	7	28
Hip		
12-month prevalence	6	24
7-day prevalence	4	16

Knees		
12-month prevalence	10	40
7-day prevalence	8	32
Ankles		
12-month prevalence	8	32
7-day prevalence	5	20
Prevented from working	10	40
Cause of taking time off work	8	32
Discomfort related	18	72

4.1.3 Physical activity level of the respondents

Table 4 summarizes the physical activity levels of the respondents, measured in Metabolic Equivalent of Task (METs). The total METs ranged from 292 to 12,585, with an average of 3451.70 {± 3280.81}. This indicates considerable variability in the physical activity levels among the respondents.

Breaking down the components, vigorous physical activity contributed an average of 810.56 METs {± 1149.73}, ranging from 0.00 to 3960 METs. Moderate physical activity was higher, with a mean of 1605.60 METs {± 1453.95} and a range of 160 to 5160 METs.

Walking activity contributed an average of 1035.54 METs {± 1179.44}, ranging from 49.50 to 4389 METs.

Regarding physical activity categories, the majority of respondents (13, 52%) were classified as having a high level of physical activity. Nine respondents (36%) had a moderate level of physical activity, while only three respondents (12%) were classified as having low physical activity levels.

These findings suggest that over half of the respondents were engaged in sufficient physical activity to be categorized as highly active, with only a small proportion exhibiting low activity levels. This highlights a generally favorable level of physical activity among the study population

Table 4: Physical activity level of the respondents

	Range	**Mean ± SD**
Vigorous MET	0.00 – 3960	810.56 ± 1149.73
Moderate MET	160 – 5160	1605.60 ± 1453.95
Walking MET	49.50 – 4389	1035.54 ± 1179.44
Total MET	292 – 12585	3451.70 ± 3280.81
PA Level	**Frequency (n)**	**Percentage (%)**
Low	3	12
Moderate	9	36
High	13	52

4.1.4 Association between physical activity level and 12-month prevalence of musculoskeletal pain

Table 5 examines the relationship between physical activity levels and the 12-month prevalence of musculoskeletal pain. Neck pain was reported by 66.7% of respondents with low and moderate physical activity levels, while it was slightly higher (76.9%) among those with high physical activity. Similarly, shoulder pain was more prevalent among the respondents with high physical activity levels (n=9, 69.2%) compared to those with low (n=1, 33.3%) or moderate levels (n=2, 22.2%). However, these variations were not statistically significant. For upper back pain, the highest prevalence was also observed in respondents with high physical activity levels (n=10, 76.9%), while those with low (n=1) and moderate (n=3) activity reported equal prevalence (33.3%). These differences did not reach statistical significance.

In the case of lower back pain, prevalence was equal (66.7%) among respondents with low (n=2) and moderate (n=6) physical activity levels but was lower (46.2%) in those with high (n=6) physical activity. Elbow pain was rare, with no cases reported among those with low (n=0) physical activity and slightly higher prevalence in respondents with moderate (n=1, 11.1%) and high activity levels (n=2, 15.4%). Wrist pain showed a higher prevalence among respondents with moderate (n=5, 55.6%) and high (n=7, 53.8%) physical activity compared to those with low activity levels (n=0, 0%).

The prevalence of hip pain was relatively low overall, with little variation observed across different activity levels. Specifically, the prevalence was 33.3% for low activity levels (n=1), 22.2% for moderate activity levels (n=2), and 23.1% for high activity levels (n=3).

Similarly, knee pain was slightly more common among those with moderate (n=4, 44.4%) and high activity levels (n=5, 38.5%) compared to those with low activity (n=1, 33.3%). Ankle pain followed a similar pattern, with no cases reported in respondents with low physical activity, but slightly higher prevalence among those with moderate (n=3, 33.3%) and high (n=5, 38.5%) activity levels.

Although variations were observed across different activity levels and pain prevalence, none of these differences were statistically significant. This suggested that physical activity levels may not have played a significant role in determining the 12-month prevalence of musculoskeletal pain among the respondents.

Table 5: Association between physical activity level and 12-month prevalence of musculoskeletal pain

Physical activity level	Prevalence of musculoskeletal pain (% within physical activity level)	X^2	p
	Neck pain		
Low	2 (66.7)	0.326	0.850
Moderate	6 (66.7)		
High	10 76.9)		
	Shoulder pain		
Low	1 (33.3)	5.002	0.082
Moderate	2 (22.2)		
High	9 (69.2)		
	Upper back pain		
Low	1 (33.3)	4.812	0.090
Moderate	3 (33.3)		
High	10 (76.9)		
	Low back pain		
Low	2 (66.7)	1.066	0.587
Moderate	6 (66.7)		
High	6 (46.2)		
	Elbow pain		
Low	0 (0)	0.557	0.757
Moderate	1 (11.1)		
High	2 (15.4)		
	Wrist pain		
Low	0 (0)	3.153	0.207
Moderate	5 (55.6)		
High	7 (53.8)		

	Hip pain		
Low	1 (33.3)	0.165	0.921
Moderate	2 (22.2)		
High	3 (23.1)		
	Knee pain		
Low	1 (33.3)	0.142	0.931
Moderate	4 (44.4)		
High	5 (38.5)		
	Ankle pain		
Low	0 (0)	1.669	0.434
Moderate	3 (33.3)		
High	5 (38.5)		

4.1.5 Association between physical activity level and 7-day prevalence of musculoskeletal pain

For neck pain, prevalence was slightly higher among those with high (69.2%) and moderate (66.7%) physical activity levels, while no cases were reported among respondents with low physical activity. However, this difference was not statistically significant ($p = 0.077$). Shoulder pain followed a similar pattern, being most prevalent in respondents with high physical activity (61.5%) compared to moderate (22.2%) and low levels (0%), though the association was not statistically significant ($p = 0.058$).

A significant association was found between physical activity levels and the 7-day prevalence of upper back pain ($X^2 = 6.851$, $p = 0.033$). Respondents with high physical activity levels reported the highest prevalence of upper back pain (76.9%), compared to those with low (33.3%) and moderate (22.2%) activity levels.

Lower back pain was most prevalent in respondents with low physical activity levels (66.7%), followed by those with high (46.2%) and moderate activity levels (33.3%). Elbow pain was rare, with no cases reported among respondents with low or moderate activity levels and a slight prevalence (15.4%) among those with high physical activity. Wrist pain was more prevalent in respondents with high physical activity (38.5%) than in those with moderate (11.1%) or low activity levels (33.3%), though the differences were not statistically significant ($p = 0.364$).

Hip pain showed minimal variation across activity levels, being slightly higher among respondents with high physical activity (23.1%) compared to those with low activity (33.3%), while no cases were reported in respondents with moderate activity. Similarly, knee pain was more preva-

lent among those with high physical activity (46.2%) compared to moderate (11.1%) and low (33.3%) levels, though these differences were not statistically significant ($p = 0.223$).

Ankle pain showed an unusual pattern, being most prevalent among respondents with moderate physical activity (44.4%) compared to low (0%) and high levels (7.7%). While variations in prevalence were observed across other body regions, no statistically significant associations were found

Table 6: Association between physical activity level and 7-day prevalence of musculoskeletal pain

Physical activity level	Prevalence of musculoskeletal pain (% within physical activity level)	X^2	p
	Neck pain		
Low	0 (0)	5.128	0.077
Moderate	6 (66.7)		
High	9 (69.2)		
	Shoulder pain		
Low	0 (0)	5.698	0.058
Moderate	2 (22.2)		
High	8 (61.5)		
	Upper back pain		
Low	1 (33.3)	6.851	0.033*
Moderate	2 (22.2)		
High	10 (76.9)		
	Low back pain		
Low	2 (66.7)	1.066	0.587
Moderate	3 (33.3)		
High	6 (46.2)		
	Elbow pain		
Low	0 (0)	2.007	0.367
Moderate	0 (0)		
High	2 (15.4)		
	Wrist pain		
Low	1 (33.3)	2.021	0.364
Moderate	1 (11.1)		
High	5 (38.5)		

	Hip pain		
Low	1 (33.3)	2.869	0.238
Moderate	0 (0)		
High	3 (23.1)		
	Knee pain		
Low	1 (33.3)	3.004	0.223
Moderate	1 (11.1)		
High	6 (46.2)		
	Ankle pain		
Low	0 (0)	5.342	0.069
Moderate	4 (44.4)		
High	1 (7.7)		

4.1.6 Association between non-academic job role and 12-month prevalence of musculoskeletal pain

Table 7 shows the relationship between non-academic job roles and the 12-month prevalence of musculoskeletal pain.

For neck pain, clerical staff reported the highest prevalence (85.7%), followed by administrative staff (71.4%) and technical staff (50%). No neck pain was reported among lab attendants, while the single Youth Corper from the nursing department reported experiencing neck pain. However, these differences were not statistically significant ($p = 0.393$).

Shoulder pain was most common among clerical staff (71.4%) and technical staff (50%), while administrative staff reported a prevalence of 42.9%. Lab attendants and the Youth Corper reported no cases of shoulder pain. The observed differences were not significant ($p = 0.472$).

Upper back pain showed the highest prevalence among technical staff and lab attendants (100% each), while clerical staff (71.4%) and administrative staff (35.7%) reported lower prevalence rates. The Youth Corper also reported upper back pain. Despite these variations, the differences were not statistically significant ($p = 0.188$).

Low back pain was reported across all job roles, with the highest prevalence among lab attendants (100%). Clerical staff reported 57.1%, while administrative and technical staff both reported 50%. The Youth Corper also reported experiencing low back pain. These differences were not statistically significant ($p = 0.771$).

Elbow pain was reported by clerical, administrative, and technical staff at varying rates (14.3%, 7.1%, and 50%, respectively). No elbow pain was reported by lab attendants or the Youth Corper. The differences were not statistically significant ($p = 0.500$).

Wrist pain was most prevalent among administrative and technical staff (50% each), followed by clerical staff (42.9%). No wrist pain was reported by lab attendants. The Youth Corper reported wrist pain, but the differences were not significant ($p = 0.716$).

For hip pain, lab attendants had the highest prevalence (100%), while clerical and administrative staff reported 28.6% and 21.4%, respectively. No hip pain was reported by technical staff. The Youth Corper did not report hip pain. The differences in hip pain prevalence were not statistically significant ($p = 0.374$).

Knee pain was reported by all groups except technical staff, with lab attendants showing the highest prevalence (100%), followed by clerical staff (57.1%) and administrative staff (35.7%). The Youth Corper reported no knee pain. These differences were not statistically significant ($p = 0.347$).

Lastly, ankle pain was most prevalent among technical staff (100%), while clerical and administrative staff reported 28.6% each. No cases were reported by lab attendants, and the Youth Corper did not report ankle pain. These differences were not statistically significant ($p = 0.257$).

Overall, variations in musculoskeletal pain prevalence were observed across job roles. However, none of these differences reached statistical significance.

Table 7: Association between non-academic job role and 12-month prevalence of musculoskeletal pain

Job role	Prevalence of musculoskeletal pain (% within job role)	X^2	p
	Neck pain		
Clerical	6 (85.7)	4.096	0.393
Administrative	10 (71.4)		
Technical	1 (50.0)		
Lab attendant	0 (0)		
Youth Corper	1 (100)		
	Shoulder pain		
Clerical	5 (71.4)	3.537	0.472
Administrative	6 (42.9)		
Technical	1 (50.0)		
Lab attendant	0 (0)		
Youth Corper	0 (0)		
	Upper back pain		
Clerical	5 (71.4)	6.157	0.188
Administrative	5 (35.7)		
Technical	2 (100)		
Lab attendant	1 (100)		
Youth Corper	1 (100)		
	Low back pain		
Clerical	4 (57.1)	1.809	0.771
Administrative	7 (50.0)		
Technical	1 (50.0)		
Lab attendant	1 (100)		
Youth Corper	1 (100)		

	Elbow pain		
Clerical	1 (14.3)	3.355	0.50
Administrative	1 (7.1)		
Technical	1 (50)		
Lab attendant	0 (0)		
Youth Corper	0 (0)		
	Wrist pain		
Clerical	3 (42.9)	2.106	0.716
Administrative	7 (50)		
Technical	1 (50)		
Lab attendant	0 (0)		
Youth Corper	1 (100)		
	Hip pain		
Clerical	2 (28.6)	4.245	0.374
Administrative	3 (21.4)		
Technical	0 (0)		
Lab attendant	1 (100)		
Youth Corper	0 (0)		
	Knee pain		
Clerical	4 (57.1)	4.464	0.347
Administrative	5 (35.7)		
Technical	0 (0)		
Lab attendant	1 (100)		
Youth Corper	0 (0)		
	Ankle pain		
Clerical	2 (28.6)	5.305	0.257
Administrative	4 (28.6)		

Technical	2 (100)
Lab attendant	0 (0)
Youth Corper	0 (0)

4.1.7 Association between non-academic job role and 7-day prevalence of musculoskeletal pain

Table 8 presents the relationship between non-academic job roles and the 7-day prevalence of musculoskeletal pain.

For neck pain, clerical staff had the highest prevalence (85.7%), followed by administrative and technical staff (50% each). No neck pain was reported by lab attendants, and the Youth Corper from the nursing department also reported neck pain. However, the differences were not statistically significant ($p = 0.313$).

Shoulder pain showed a significant association across job roles. Clerical staff reported the highest prevalence (85.7%), followed by technical staff (50%). No shoulder pain was reported by lab attendants or the Youth Corper. The differences were statistically significant ($p = 0.049$).

Upper back pain was most common among clerical staff (85.7%), with lower prevalence in administrative staff (28.6%) and technical staff (50%). Lab attendants and the Youth Corper each reported upper back pain. Although the findings suggest some variation, they were not statistically significant ($p = 0.087$).

For low back pain, clerical staff reported 57.1%, administrative staff 35.7%, and technical staff reported no cases. Lab attendants and the Youth Corper each reported low back pain. The association was not statistically significant ($p = 0.288$).

Elbow pain was reported by clerical (14.3%), technical (50%), and no staff from other roles. The Youth Corper did not report elbow pain. However, the association observed in elbow pain was not statistically significant ($p = 0.161$).

Wrist pain was most prevalent among clerical staff (42.9%) and technical staff (100%). Administrative staff reported a lower prevalence (14.3%), while lab attendants and the Youth Corper did not report wrist pain. Although the differences were suggestive of some variation, they were not statistically significant ($p = 0.092$).

Hip pain had a significant association with job role. Clerical staff reported 28.6%, technical staff reported 50%, and lab attendants reported 100%. No hip pain was reported by administrative staff or the youth Corper. These differences were statistically significant ($p = 0.031$).

Knee pain was reported by clerical staff (42.9%), administrative staff (21.4%), and technical staff (50%). Lab attendants and the Youth Corper reported knee pain at 100%. However, these associations were not statistically significant ($p = 0.407$).

Ankle pain was most prevalent among technical staff (50%), with clerical and administrative staff both reporting 14.3% and 21.4%, respectively. Lab attendants and the Youth Corper did not report ankle pain. The association was not statistically significant ($p = 0.775$).

In summary, significant associations were observed between job role and shoulder and hip pain. While variations in musculoskeletal pain prevalence were noted across other regions, these did not reach statistical significance.

Table 8: Association between non-academic job role and 7-day prevalence of musculoskeletal pain

Job role	Prevalence of musculoskeletal pain (% within job role)	X^2	p
	Neck pain		
Clerical	6 (85.7)	4.762	0.313
Administrative	7 (50)		
Technical	1 (50)		
Lab attendant	0 (0)		
Youth Corper	1 (100)		
	Shoulder pain		
Clerical	6 (85.7)	9.524	0.049*
Administrative	3 (21.4)		
Technical	1 (50)		
Lab attendant	0 (0)		
Youth Corper	0 (0)		
	Upper back pain		
Clerical	6 (85.7)	8.116	0.087
Administrative	4 (28.6)		
Technical	1 (50)		
Lab attendant	1 (100)		
Youth Corper	1 (100)		
	Low back pain		
Clerical	4 (57.1)	4.998	0.288
Administrative	5 (35.7)		
Technical	0 (0)		
Lab attendant	1 (100)		
Youth Corper	1 (100)		

	Elbow pain		
Clerical	1 (14.3)	6.561	0.161
Administrative	0 (0)		
Technical	1 (50)		
Lab attendant	0 (0)		
Youth Corper	0 (0)		
	Wrist pain		
Clerical	3 (42.9)	7.993	0.092
Administrative	2 (14.3)		
Technical	2 (100)		
Lab attendant	0 (0)		
Youth Corper	0 (0)		
	Hip pain		
Clerical	2 (28.6)	10.651	0.031*
Administrative	0 (0)		
Technical	1 (50)		
Lab attendant	1 (100)		
Youth Corper	0 (0)		
	Knee pain		
Clerical	3 (42.9)	3.992	0.407
Administrative	3 (21.4)		
Technical	1 (50)		
Lab attendant	1 (100)		
Youth Corper	0 (0)		
	Ankle pain		
Clerical	1 (14.3)	1.786	0.775
Administrative	3 (21.4)		
Technical	1 (50)		

Lab attendant	0 (0)
Youth Corper	0 (0)

4.2 Hypotheses Testing

Main Hypotheses

Hypothesis I: There would be no significant association between physical activity levels and MSDs among non-academic office workers across the selected Departments at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: Chi-square

Observed p-value (12-month Prevalence of Musculoskeletal Pain)

Neck pain: p = 0.226

Shoulder pain: p = 0.369

Upper back pain: p = 0.342

Lower back pain: p = 0.288

Elbow pain: p = 0.161

Wrist pain: p = 0.092

Hip pain: p = 0.775

Knee pain: p = 0.407

Ankle pain: p = 0.775

JUDGMENT: For the 12-month prevalence of musculoskeletal pain, all p-values were greater than 0.05, and thus the null hypothesis is NOT REJECTED.

7-day prevalence:

Observed p-value (7-day Prevalence of Musculoskeletal Pain)

Neck pain: p = 0.077

Shoulder pain: p = 0.058

Upper back pain: p = 0.033*

Lower back pain: p = 0.288

Elbow pain: p = 0.364

Wrist pain: p = 0.364

Hip pain: p = 0.223

Knee pain: p = 0.223

Ankle pain: p = 0.113

JUDGMENT: For the 7-day prevalence of musculoskeletal pain, the null hypothesis is REJECTED only for upper back pain (p = 0.033*)

For other body regions, the p-values were greater than 0.05, meaning the null hypothesis is NOT REJECTED for those areas, suggesting no significant association.

SUB HYPOTHESIS

Hypothesis I: There would be no significant difference in the prevalence of MSDs across different non-academic job roles at the School of Basic Medical Sciences, UNIBEN.

12-month prevalence

Alpha level: 0.05

Test statistic: Chi-square

Neck pain prevalence across job roles:

Clerical staff: 85.7%

Administrative staff: 71.4%

Technical staff: 50%

Lab attendants: 0%

Youth Corper: 100%

Observed p value = 0.393 (Not significant)

Shoulder pain prevalence across job roles:

Clerical staff: 71.4%

Technical staff: 50%

Administrative staff: 42.9%

Lab attendants: 0%

Youth Corper: 0%

observed P value = 0.472 (Not significant)

Upper back pain prevalence across job roles:

Technical staff: 100%

Lab attendants: 100%

Clerical staff: 71.4%

Administrative staff: 35.7%

Youth Corper: 100%

P = 0.188 (Not significant)

Low back pain prevalence across job roles:

Lab attendants: 100%

Clerical staff: 57.1%

Administrative staff: 50%

Technical staff: 50%

Youth Corper: 100%

P = 0.771 (Not significant)

Elbow pain prevalence across job roles:

Clerical staff: 14.3%

Administrative staff: 7.1%

Technical staff: 50%

Lab attendants: 0%

Youth Corper: 0%

P = 0.500 (Not significant)

Wrist pain prevalence across job roles:

Administrative staff: 50%

Technical staff: 50%

Clerical staff: 42.9%

Lab attendants: 0%

Youth Corper: 0%

P = 0.716 (Not significant)

Hip pain prevalence across job roles:

Lab attendants: 100%

Clerical staff: 28.6%

Administrative staff: 21.4%

Technical staff: 0%

Youth Corper: 0%

P = 0.374 (Not significant)

Knee pain prevalence across job roles:

Lab attendants: 100%

Clerical staff: 57.1%

Administrative staff: 35.7%

Technical staff: 0%

Youth Corper: 0%

P = 0.347 (Not significant)

Ankle pain prevalence across job roles:

Technical staff: 100%

Clerical staff: 28.6%

Administrative staff: 21.4%

Lab attendants: 0%

Youth Corper: 0%

P = 0.257 (Not significant)

JUDGMENT: For 12-month prevalence data, the hypotheses was NOT REJECTED for all body regions across the 12-month data.

7 days prevalence

Alpha level: 0.05

Test statistic: Chi-square

Neck pain prevalence across job roles:

Clerical staff: 85.7%

Administrative staff: 50%

Technical staff: 50%

Lab attendants: 0%

Youth Corper: 100%

P = 0.313 (Not significant)

Shoulder pain

Clerical staff: 85.7%

Technical staff: 50%

Administrative staff: 42.9%

Lab attendants: 0%

Youth Corper: 0%

P = 0.049* (Significant)

Upper back pain:

Clerical staff: 85.7%

Administrative staff: 28.6%

Technical staff: 50%

Lab attendants: 0%

Youth Corper: 100%

P = 0.087 (Not significant)

Low back pain:

Clerical staff: 57.1%

Administrative staff: 35.7%

Technical staff: 0%

Lab attendants: 100%

Youth Corper: 100%

P = 0.288 (Not significant)

Elbow pain:

Clerical staff: 14.3%

Technical staff: 50%

Administrative staff: 0%

Lab attendants: 0%

Youth Corper: 0%

P = 0.161 (Not significant)

Wrist pain:

Clerical staff: 42.9%

Technical staff: 100%

Administrative staff: 14.3%

Lab attendants: 0%

Youth Corper: 0%

P = 0.092 (Not significant)

Hip pain:

Clerical staff: 28.6%

Technical staff: 50%

Lab attendants: 100%

Administrative staff: 0%

Youth Corper: 0%

P = 0.031* (Significant)

Knee pain:

Clerical staff: 42.9%

Administrative staff: 21.4%

Technical staff: 50%

Lab attendants: 100%

Youth Corper: 0%

P = 0.407 (Not significant)

Ankle pain:

Technical staff: 50%

Clerical staff: 14.3%

Administrative staff: 21.4%

Lab attendants: 0%

Youth Corper: 0%

P = 0.775 (Not significant)

JUDGMENT:

For 7-day prevalence data, significant differences were found for:

1. Shoulder pain (p = 0.049*): The prevalence of shoulder pain was notably higher among clerical staff (85.7%) compared to other job roles, indicating that this group was more affected by shoulder pain in the past week of the study.
2. Hip pain (p = 0.031*): Lab attendants (100%) experienced the highest prevalence of hip pain in the past week, significantly influencing the observed results.

Therefore, this hypothesis is partially REJECTED for shoulder pain (clerical staff) and hip pain (lab attendants) in the 7-day prevalence, while it is NOT REJECTED for all other body regions

Hypothesis II

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of neck Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.850

Judgment: Since p > 0.05, there was no significant relationship between physical activity level and the 12-month prevalence of neck pain. The hypothesis was therefore NOT REJECTED.

Hypothesis III

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of shoulder Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.082

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of shoulder pain. The hypothesis was therefore NOT REJECTED.

Hypothesis IV

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of upper back Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.090

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of upper back pain. The hypothesis was therefore NOT REJECTED.

Hypothesis V

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of low back Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.587

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of low back pain. The hypothesis was therefore NOT REJECTED.

Hypothesis VI

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of elbow Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.757

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of elbow pain. The hypothesis was therefore NOT REJECTED.

Hypothesis VII

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of wrist Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.207

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of wrist pain. The hypothesis was therefore NOT REJECTED.

Hypothesis VIII

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of hip Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.921

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of hip pain. The hypothesis was therefore NOT REJECTED.

Hypothesis IX

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of knee Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.931

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of knee pain. The hypothesis was therefore NOT REJECTED.

Hypothesis X

There would be no significant Relationship Between Physical Activity Level and the 12-Month Prevalence of ankle Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.434

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the 12-month prevalence of ankle pain. The hypothesis was therefore NOT REJECTED.

Hypothesis XI

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of neck Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.077

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of neck pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Hypothesis XII

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of shoulder Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.058

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of shoulder pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Hypothesis XIII

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of upper back Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.033*

Judgement: Since $p < 0.05$, there was a significant relationship between physical activity level and the prevalence of upper back pain in the past 7 days. The Hypothesis was therefore REJECTED.

Hypothesis XIV

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of low back Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.587

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of low back pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Hypothesis XV

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of elbow Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.367

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of elbow pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Hypothesis XVI

There would be no significant relationship Between Physical Activity Level and the 7-day prevalence of wrist Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.364

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of wrist pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Hypothesis XVII

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of hip Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.238

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of hip pain in the past 7 days. The hypothesis was therefore ACCEPTED.

Hypothesis XVIII

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of knee Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.223

Judgement: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of knee pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Hypothesis XIX

There would be no significant Relationship Between Physical Activity Level and the 7-day prevalence of ankle Pain among non-academic office workers at the School of Basic Medical Sciences, UNIBEN

Alpha level: 0.05

Test statistic: chi square

Observed p value: 0.069

Judgment: Since $p > 0.05$, there was no significant relationship between physical activity level and the prevalence of ankle pain in the past 7 days. The hypothesis was therefore NOT REJECTED.

Based on the analysis of both 12-month and 7-day prevalence data, the hypothesis was REJECTED only in the case of upper back pain (7-day prevalence), where a significant association was found. For all other body regions, there was no significant relationship between physical activity levels and musculoskeletal pain, and the hypothesis was NOT REJECTED.

CHAPTER FIVE

DISCUSSION, CONCLUSION, RECOMMENDATIONS, AND IMPLICATIONS

5.1 Discussion

This study investigated the relationship between physical activity levels and musculoskeletal disorders (MSDs) among non-academic secretarial staff at the School of Basic Medical Sciences, University of Benin. The study provided significant insights into the prevalence of MSDs and their association with physical activity levels. Among the 25 participants, all reported experiencing musculoskeletal pain over the past 12 months and 7 days, indicating a remarkably high prevalence rate. The neck, upper back, and lower back emerged as the most commonly affected regions, consistent with findings from similar studies, such as Yüzügüllü (2023), who observed neck and low back pain as predominant issues among office workers in Adana, Turkey. These findings highlight the universal challenge of MSDs in sedentary office environments, particularly among individuals with prolonged sitting hours and inadequate physical activity.

Interestingly, although a significant proportion of respondents (52%) engaged in high levels of physical activity, the prevalence of MSDs remained high, with no statistically significant differences observed across physical activity categories. This outcome aligns with studies like Tami et al. (2021) and Alseminy et al. (2022), which reported no significant associations between physical activity levels and the prevalence of MSDs. The results suggested that while physical activity contributed positively to overall health, it may not directly mitigate MSDs if ergonomic factors and work patterns remain unaddressed.

Further analysis revealed that shoulder and upper back pain were more prevalent among respondents with high physical activity levels. A significant association was observed between physical activity levels and the 7-day prevalence of upper back pain, where higher physical activity corresponded to increased prevalence. This finding contrasts with studies such as the one done by Amatori et al. (2024), which emphasized that higher physical activity levels reduce MSDs. The discrepancy may be attributed to the type or intensity of physical activity performed by the respondents, as poorly structured or excessive physical activities can exacerbate existing conditions, as noted by Moreira et al. (2021).

The relationship between job roles and MSDs also provided critical insights. Clerical staff reported the highest prevalence of neck, shoulder, and upper back pain, with significant associations observed for shoulder and hip pain. This aligned with findings by Fatudimu et al. (2022) and Jahanbin et al. (2022), which highlighted those poor ergonomic designs and prolonged sedentary behavior significantly contributed to MSDs among academic and office staff. The uniform use of standard desks and chairs by all respondents may have further compounded ergonomic challenges, as standard office furniture often fails to provide adequate support for long durations of use, contributing to the development of MSDs.

Despite the high prevalence of MSDs, the study found no statistically significant associations between physical activity levels and 12-month prevalence rates for most body regions. This aligns with studies by Zengin et al. (2023) and Grabara (2023), which suggest that while physical activity improves general health, its impact on specific MSDs may be limited without concurrent ergonomic interventions. Additionally, the findings echo Cho et al. (2012), who emphasized the

role of psychosocial factors and workload in exacerbating musculoskeletal symptoms among computer users.

Overall, these results underscore the multifaceted nature of MSDs, where physical activity alone is insufficient to alleviate symptoms. Effective mitigation requires a comprehensive approach that combines ergonomic interventions, regular breaks, and targeted physical activity regimens tailored to individual needs.

5.2 Conclusion

This study revealed a high prevalence of musculoskeletal disorders among non-academic staff at the School of Basic Medical Sciences, with neck, upper back, and lower back regions most affected. While physical activity levels were generally high among respondents, no significant associations were found between physical activity and the prevalence of MSDs, emphasizing the need for a holistic approach to addressing these disorders. Ergonomic factors and job roles were significant contributors, particularly among clerical staff, highlighting the importance of workplace adjustments.

5.3 Recommendations

1. Prioritize ergonomic improvements, including adjustable desks, ergonomic chairs, and supportive workstation setups, to reduce strain on commonly affected regions like the neck and back.
2. Incorporate structured physical activity programs tailored to mitigate musculoskeletal strain and promote overall physical health among office workers.
3. Encourage regular breaks and posture training during work hours to reduce prolonged sitting and enhance musculoskeletal health.

4. Develop workplace policies that promote ergonomic awareness and integrate health-focused interventions into organizational wellness programs.

5.4 Implications for Further Studies

1. Future research should investigate the effectiveness of combining tailored physical activity regimens with ergonomic interventions in reducing the prevalence of musculoskeletal disorders (MSDs).
2. Conduct longitudinal studies with larger and more diverse samples to establish causal relationships between physical activity, ergonomic factors, and MSD prevalence.
3. Explore the psychosocial aspects of MSDs, such as the impact of stress and workload, to gain a more comprehensive understanding of their effects on office workers.
4. Evaluate the long-term benefits of workplace modifications, including ergonomic improvements and targeted physical activity programs, on musculoskeletal health and productivity.

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APPENDICES

APPENDIX 1

INFORMED CONSENT FORM

TITLE OF STUDY: RELATIONSHIP BETWEEN PHYSICAL ACTIVITY LEVEL AND MUSCULOSKELETAL DISORDERS AMONG NON-ACADEMIC OFFICE WORKERS IN THE SCHOOL OF BASIC MEDICAL SCIENCES, UNIBEN.

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Ethics and Research Committee

College of Medical Sciences, University of Benin. Benin City.

PARTICIPATION: Participation in this study is voluntary, refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may also continue your participation at any time without penalty or loss of benefits. The principal investigation may decide to withdraw you from the study if we are unable to obtain the necessary information.

Consent: Now that this study has been explained to me in details and I understand the nature and purpose of the study, I am willing to participate in the study.

[ ] Yes, I consent voluntarily to take part as a participant in this study.

[ ] No, I do not consent to participate in this study.

APPENDIX 2

EXTENDED NORDIC MUSCULOSKELETAL QUESTIONNAIRE (NMQE)

PART A: DEMOGRAPHICS

PLEASE FILL IN THE DETAILS

1. GENDER: **[ ]** Male **[ ]** Female
2. AGE_____
3. DEPARTMENT: **[ ]** Medical Laboratory Science **[ ]** Nursing **[ ]** Physiotherapy **[ ]** Radiography
4. JOB ROLE: **[ ]** Clerical **[ ]** Administrative **[ ]** Technical **[ ]** Others (specify): _____
5. Years of Service: _____

PART B: WORKSTATION SETUP

INSTRUCTION: *Please select the option that best describes your usual workstation setup. This will help us understand your work environment and its impact on your potential impact on your health.*

1. What type of desk do you use most often?

- **[ ]** Standard desk
- **[ ]** Sit-stand adjustable desk
- **[ ]** Other: _____

2. What type of chair do you use most often?

- **[ ]** Standard chair (non-adjustable)
- **[ ]** Ergonomic chair (adjustable for posture)
- **[ ]** No chair (I work standing)
- **[ ]** Other: _____

PART C: MUSCULOSKELETAL SYMPTOMS

INSTRUCTION: *Please answer by putting a cross in the appropriate box-one cross for each question. You may be in doubt on how to answer but please do your best anyway. Please answer every question, even if you have never had trouble in any part of your bod**y.***

1. In the last 12 months, have you had any ache, pain, or discomfort in the following areas?

BODY REGION	**YES**	**NO**
Neck		
Shoulders		
Upper back		
Lower back		
Elbows		
Wrists/Hands		
Hips/Thighs		
Knees		
Ankles/Feet		

2. In the last 7 days, have you experienced any ache, pain, or discomfort in the following areas?

BODY REGION	**YES**	**NO**
Neck		
Shoulders		
Upper back		
Lower back		
Elbows		
Wrists/Hands		
Hips/Thighs		
Knees		
Ankles/Feet		

3. In the past 12 months, has this discomfort prevented you from carrying out your normal work duties?

- Yes **[ ]**
- No **[ ]**

4. Have you taken time off work due to this discomfort?

- Yes **[ ]**
- No **[ ]**

5. **Do you feel that this discomfort is related to your workstation or job role?**

- Yes **[ ]**
- No **[ ]**

if Yes, specify: _____

APPENDIX 3

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (IPAQ-Short Form)

INSTRUCTION: *Please answer the following questions based on your physical activity over the last 7 days. Kindly fill in the number of days and duration for each activity as accurately as possible.*

Part A: Physical activity in the Last 7 days

I. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast cycling?

- Number of days: _____

II. How much time did you spend doing vigorous physical activities on one of those days?

- Hours: _____
- Minutes: _____

III. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling, or walking briskly (not including walking for transport)?

- Number of days: _____

IV. How much time did you usually spend doing moderate physical activities on one of those days?

- Hours: _____
- Minutes: _____

V. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?

- Number of days: _____

VI. How much time did you usually spend walking on one of those days?

- Hours: _____
- Minutes: _____

Part B: Sedentary Behavior

I. During the last 7 days, how much time did you usually spend sitting on a weekday?

- Hours: _____
- Minutes: _____