

**ASSESSMENT OF EMPLOYEES' AWARENESS OF EXERCISE
ERGONOMICS IN BANKING INSTITUTIONS IN NAIROBI, KENYA**

BY

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DECLARATION

This Thesis is my original work and has not been presented for a degree in any other University or for any other award.

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DEDICATION

This thesis is dedicated to beloved parents, Mr. and Mrs. Waiganjo. I have tried to make the dream that your children get educated come true.

ACKNOWLEDGEMENT

I am indebted to all the persons whose contributions enabled me to complete this work. My most sincere gratitude goes to my University Supervisors, Dr. Vincent Onywera and Dr. Andanje Mwisukha whose inspirations, guidance, and wise counsel shaped this research.

To my dear parents Mr. and Mrs. Waiganjo for their self-less and tireless efforts to see to it that I acquire education to the highest level possible. May God grant you good health. I am most grateful to my loving sister Cecilia and her family for the support and guidance they offered. Also to all my other brothers, sisters, relatives and friends for their encouragement.

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LIST OF ABBREVIATIONS

CTD:	Cumulative Trauma Disorders
IEA:	International Ergonomics Association
MSD:	Musculoskeletal Disorders
MSI:	Musculoskeletal Injuries
NIOSH:	National Institute for Occupational Safety and Health
OERC:	Office Ergonomics Research Committee
OSHA:	Occupational Safety and Health Administration
WRRF:	Work-Related Risk Factors

ABSTRACT

Most companies and institutions world over have embraced the use of computers at their places of work as a means of improving efficiency and productivity. The banking institutions have not been left out in this regard. As such, most of banking office work involves computer operations that are characterized by fast and frequently repetitive movement of the eyes, arms, fingers and the head. These movements involve repetitive muscular activity which could lead to the development of physiological stress manifested as fatigue due to lack of avenues to burst it out as it forms. Accumulation of fatigue may lead to the development of musculoskeletal injuries among the employees which can cause reduction in comfort, efficiency and hence production. The purpose of this study was therefore to investigate into Kenyan bank employees' awareness of the work-related risk factors that might expose them to musculoskeletal injury in the course of their duties, if they had suffered any musculoskeletal injuries and illnesses, and whether they usually perform stretching exercises in the course of their work. It was hypothesized that there would be no significant differences according to gender and position of work in relation to the above mentioned factors. The subjects for the study included tellers, secretaries, clerks, and officers in banking institutions in Nairobi. For this purpose, 5 banks (National bank, Cooperative bank, Equity bank, Kenya Commercial bank and Family Finance) consisting of 1,500 employees were purposively selected. Stratified random sampling was used to sample 17 bank branches. 450 employees were then selected randomly for the study. Questionnaires were administered to the bank employees to collect information related to the employees' awareness of the work-related risk factors, work-related injuries and illnesses and the use of exercise to alleviate such injuries. Both qualitative and Quantitative methods of data analysis were utilized to analyze the data. Chi-square at $p \leq 0.05$ was computed to test the research hypothesis. The findings of the study showed that a majority of the bank employees (51.40%) were not aware of the work-related risk factors, (47.98%) of the employees were not aware of the applicability of ergonomic exercises in the banking institutions, 128 (39.88%) were not aware of the role of ergonomic exercises in alleviating MSI, while more than (63.86%) suffered from various musculoskeletal injuries and illnesses. The male (43.61%) were significantly ($X^2 = 74.83$, $p=0.01$) more aware of the risk factors than the female (39.50%) bank employees. The female (41.32%) were significantly ($X^2 = 54.02$, $p=0.01$) more aware of the applicability of ergonomic exercises at the work places as well as their role in preventing MSI (67; 40.11%, $X^2 = 15.76$, $p=0.01$) than the male. The various cadres of employees differed significantly in awareness of work-related risk-factors ($X^2 = 36.98$, $p=0.05$), the applicability of exercises in work places ($X^2 = 16.90$, $p=0.194$), and the efficacy of exercise in alleviating MSI ($X^2 = 16.43$, $p=0.01$). In addition they differed in prevalence of musculoskeletal injuries ($X^2 = 124$, $p=0.01$).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Problem

Most companies and institutions world over have embraced the use of computers at their places of work as a means of improving efficiency and production (Andersen *et al.*, 2006). The banking institutions have not been left out in this regard. As such, most of banking office work involves computer operations that are characterized by long periods of sitting and deep concentration. Fast and frequently repetitive movement of the eyes, arms, fingers and the head also characterizes them. These movements involve a lot of muscular activity that could lead to the development of physiological stress manifested as fatigue (Graves, 1999; Kerin and Kerin, 2004).

Fatigue, if allowed to accumulate in the body would cause musculoskeletal injuries (MSI) such as back pain, neck pain, eyestrains and carpal tunnel syndrome (Bernard, 1997; Pulat, 1992; Sanders and McCormic, 1993,). In addition to repetitive work, improper working posture may also lead to these MSI. Most injuries to office workers occur when isolated body parts are over-used during repetitious routine tasks such as data entry, awkward posture, awkwardly reaching for or to transfer documents or answer and replace phones, and using mechanical time/date stamps (Kohler, 1994). The near-static postures and low overall physical activity that are common among office workers intensify the

harmful effects of repetitive tasks (Kohler, 1994; National Institute of Occupational Safety and Health, 1997; Graves 1999). This is because, whenever a mismatch occurs between the physical requirements of a job and the physical capacity of a worker, musculoskeletal disorders are deemed to occur.

Most office workers in every industry get musculoskeletal injuries. Most of them never imagined it would happen to them and still don't completely understand why it did. This is because the beginning stages of a repetitive strain injury often seem unrelated to work (Kohler, 1994). A typical musculoskeletal injuries' patient developing carpal tunnel syndrome first becomes aware of odd sensations or pain in hands and wrists at night and not during the day at work. By the time pain is noticeably present throughout the day; so much damage may have occurred that the worker never completely recovers. According to Kohler (1994), repetitive strain injuries are molehills that grow into mountains. Pain, numbness, weakness, and restricted range of motion appear "out of nowhere" and get progressively worse until the worker is debilitated, if nothing is done to intervene. Symptoms occur mostly in the upper extremities (hands and wrists, elbows, shoulders) head and neck.

Though injuries in offices appear minimal compared to manufacturing or construction, injuries among office workers are increasing faster than all other job categories combined (Kohler, 1994). According to Bernard (1999), work-related

musculoskeletal injuries have increased drastically since 1980. They comprised 18% of occupational illnesses in 1980 and increased to 65% in the late 1990s. Another by Kohler (1994), noted an unprecedented eightfold increase in Cumulative Trauma Disorders between 1982 (22,600 reported cases) and 1990 (185,400 reported cases), up from 21% of all injuries reported in 1982 to 56% in 1990. According to the Occupational Safety and Health Administration (OSHA), Musculoskeletal Disorders (MSD), currently account for one-third of all occupational injuries and illnesses reported to the Bureau of Labor Statistics (Ergopro, 2007).

Work-Related injuries and illnesses are to a large extent caused by several actions that involve repetitive motions, forceful movements, maintenance of constrained or awkward postures for prolonged periods of time, muscular tension, and contact stress (NIOSH, 1997; Subratty and Korumtollee, 2007). These factors contribute to restricted blood flow to the muscles causing imbalance in the chemical aspects of the body thus influencing the physical aspects (Subratty and Korumtollee, 2007). The most common work-related musculoskeletal injuries and illnesses include back injuries, headaches, carpal tunnel syndrome, thoracic outlet syndrome, computer vision syndrome, and neck and shoulder strains (Pulat, 1992; Sanders and McCormic, 1993; Bernard, 1997; NIOSH, 1997; Ergopro, 2007). Musculoskeletal injuries and illnesses are usually diagnosed as tendonitis; inflammation of the fluid-filled sheaths surrounding tendons that cross joints or

teno-synovitis which is nerve- compressions-such as the carpal-tunnel syndrome, wherein swollen tendons and/or their sheath exert pressure on nerves (Kohler, 1994).

These injuries and illnesses are characterized by swelling, numbness, restricted movement and weakness in or around muscles and tendons of the back, neck, shoulders, elbows, wrists, hands, or fingers (Subratty and Korumtollee, 2007). As such, people experiencing such symptoms may have difficulties with holding objects or tools in their hands. Other symptoms include numbness in the fingers, sore wrists, lower back pain or eyestrain (redness, dryness, soreness, temporary blurring of vision and headaches), aches and pains in the neck, shoulders, arms, back, thighs and lower legs (postural fatigue) (New York Reuters Health, 2004

Facts show that these conditions can be permanently devastating (Ergopro, 2007). Workers with severe MSD, often face permanent disability that prevents them from returning to their jobs or handling simple everyday tasks. These situations therefore, do not only reduce employees' productivity in their careers, but also affect their quality of life. (Kohler, 1994; Subratty and Korumtollee, 2007).

Losses from MSI are substantial and are costly to both the employees and the employers. These losses include; lost time and productivity, the cost of medical services, prescriptions and devices, and restricted work activities for injured and

partially disabled workers. This would even be worse when a company's most productive workers suffer repetitive strain injuries as a result of their hard work and fewer breaks (Gales Group, 2002; Kohler, 1994). According to the U.S. Department of Labor, the direct and indirect costs of musculoskeletal injuries and illnesses can total as much as \$20 billion dollars a year (Hajic, 2007).

Rapid and complete recovery from the musculoskeletal injuries and illnesses is by no means certain and therefore, injury prevention is all-important in office safety. It is recommended that a suitable work routine should be planned so that essential relaxation can be provided to the employees through physical movement away from the desk and periodic stretching exercises during the day's work (NIOSH, 1997; Graves, 1999). These stretching exercises in the office are called ergonomic exercises. The term ergonomics describes the profession of designing machines, tools, work environment in relation to how the body interacts with the work environment to best accommodate human performance (Britannica, 2006; NIOSH, 1997). It aims at improving the practicality, efficiency and safety of a person working with machines such as operating a computer (Britannica, 2006; Pulat, 1992; Sanders and McCormic, 1993; and NIOSH, 1997).

Ergonomic exercises at workplace especially in banks can greatly reduce the work-related musculoskeletal injuries and illnesses. (Office Ergonomics Research Committee, 1998). The easier it is to do a job, the more likely it is to see gains in

productivity due to greater efficiency and reduced time for injury (International Ergonomics Association, 2000). Many disorders and injuries are preventable when work conditions are designed for human safety and comfort. Therefore, knowledge of ergonomics principles is important for both the employees and their employers because both are responsible for a safe working environment (Gale Group Inc, 2001). This study therefore sought to investigate employees' awareness of work-related risk factors and the use of ergonomic exercises in the banking sector in Kenya.

1.2 Statement of the Problem

Banking work that involves the use of computers and characterized by repetitive movement of some body parts may result in accumulation of fatigue and eventual development of work-related musculoskeletal injuries and illnesses such as carpal tunnel syndrome, lower back pain, and computer vision syndrome (Graves, 1999). Indeed, limited computer-user employees' involvement in schedule selection, long workdays, consecutive workdays and low physical activity are all linked to work-related injuries and illnesses (Rosecrance *et al.*, 1998; Kerin and Kerin, 2004). Studies have shown that these work-related injuries and illnesses may lead to poor work performance such as decreased bank profits due to increased employee compensation costs, medical claims, and lost work time (Gale Group Inc, 2001). Studies such as those by Kietrys (2007), Khan and Siddiqui (2005), and Fenety and Walker (2002) noted that these injuries could be prevented

through employee participation in ergonomic exercises. However, Orta (1991) emphasized that prevention would only be possible if the employees are aware of the risk factors and willing to take part in the preventive measures put in place. In view of the foregoing, the present study sought to investigate the current situation among bank employees in Kenya. The study investigated if the bank employees in Nairobi were aware of the work-related risk factors in their work environment that would lead to injury and reduced productivity. It also sought to identify the most common musculoskeletal injuries and illnesses amongst the bank employees and to determine the employees' awareness of ergonomic exercises as well as their efficacy in the management the injuries and illnesses.

1.3 Purpose of the Study

The purpose of this study was to investigate bank employees' awareness of work-related risk factors, work-related musculoskeletal injuries and illnesses, and the use of ergonomic exercises to prevent and control the occurrence of these MSI.

1.4 Objectives of the Study

The study was designed to achieve the following objectives:

- i. To identify the most common work-related musculoskeletal injuries and their prevalence among the employees in banking institutions in Nairobi.
- ii. To investigate whether bank employees in Nairobi are aware of the work-related risk factors.

- iii. To investigate whether bank employees in Nairobi are aware of the efficacy of ergonomic exercises in reducing the occurrence of MSI.
- iv. To establish whether there is any difference among the clerks, tellers, secretaries and officers in terms of their levels of awareness of the work-related risk factors.
- v. To investigate if there is any difference among the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises.
- vi. To establish whether there is any difference among the clerks, tellers, secretaries and officers in terms of their awareness of the efficacy of ergonomic exercises in the reduction of the occurrence of MSI.
- vii. To investigate if there is any difference among the clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses.
- viii. To investigate if there is any difference between male and female bank employees in terms of their levels of awareness of the work-related risk factors.
- ix. To investigate if there is any difference between male and female bank employees in Nairobi in terms of engagement in ergonomic exercises.
- x. To establish whether there is any difference between male and female bank employees in Nairobi in terms awareness of the efficacy of ergonomic exercises in the reduction of MSI.

xi. To establish whether there is any difference between male and female bank employees in Nairobi in terms of prevalence of work-related musculoskeletal injuries.

1.5 Research Hypothesis

Ho₁ There would be no significant difference amongst the male and female bank employees in terms of their awareness of work-related risk factors.

Ho₂ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their awareness of work-related risk factors.

Ho₃ There would be no significant difference amongst the male and female bank employees in terms of their awareness of the efficacy of ergonomic exercises in reducing the occurrence of MSI.

Ho₄ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their awareness of the efficacy of ergonomic exercises in reducing the occurrence of MSI.

Ho₅ There would be no significant difference amongst the male and female bank employees in terms of their engagement in ergonomic exercises during the official working hours.

Ho₆ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises.

Ho₇ There would be no significant difference amongst the male and female bank employees in terms of prevalence of work-related musculoskeletal injuries

Ho₈ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses.

1.6 Significance of the Study

Attention to ergonomics helps to reduce workplace injuries that would otherwise result to poor performance (National Institute of Occupational Safety and Health, 1997). Knowledge of ergonomics principles is therefore important for both workers and employers because they both share responsibility for a safe environment. Findings of this study will guide the exercise ergonomics operations in the banking institutions. It will also contribute to the body of knowledge in the area of exercise ergonomics. The information will further be used to develop an exercise program for the bank employees and provide information that will ensure safety and good health of bank employees. The above mentioned factors will in turn enhance effectiveness and efficiency in service delivery. In addition, as a result of increased awareness and improvement in health standards will increase customer satisfaction and reduce time lost on sick leave thus resulting to economic gains.

1.7 Conceptual Framework

Office work usually involves long periods of sitting, writing, reading and operating computers. People who work with intense concentration or at high speeds such as those who use computers extensively often work in poor posture and are especially prone to developing stress-related complications (I E A, 2000). Banking activities are characterized by fast and frequently repetitive movements of the various body parts leading to the development of physiological stress manifested as fatigue (Bernard, 1997; Pulat, 1992; Sanders and McCormic, 1993). Fatigue, if allowed to accumulate in the body would lead to MSI (Bernard, 1997). Redesigning tools or workstation to reduce the risk factors as well as providing specific training in risks avoidance and adjustment procedures is central to the prevention of MSI (Pulat, 1992; NIOSH, 1997). This is possible through ergonomics because it aims at improving the practicality, efficiency and safety in a work- station (Britannica, 2006; Sanders and McCormic, 1993).

Ergonomic exercises can greatly reduce the injuries that occur to the body at the workstation. When a workstation is set up properly, one is less likely to have problems such as headaches or eyestrain, there are reduced chances of neck and back pain, and there is greater prevention of conditions such as carpal tunnel syndrome (Office Ergonomics Research Committee, 1998). Many disorders and injuries are preventable when work conditions are designed for human safety and comfort. Attention to ergonomics principles helps to reduce workplace injuries

and illnesses that may result to workers' compensation costs, medical claims, and lost work time (Gale Group Inc, 2001).

It is evident from figure 1.1 below that banking tasks are characterized by long sitting hours, little or no time for rest and recovery, repetition and high frequency. These working conditions may expose the employees to work-related risk factors such as fatigue, tension, poor posture, and trauma. If these risk factors were allowed to accumulate and take control of the employees' health and safety, they would lead to the development of work-related musculoskeletal injuries and illnesses such as lower back injuries, carpal tunnel syndrome, neck and shoulder injuries, headaches, and computer vision syndrome. The presence of these injuries and illnesses would have negative effects on the employees and their productivity as a result of increased discomfort, increased time off for injuries and decreased productivity. However, with the introduction of ergonomic exercises before or after the occurrence of the risk factors, the situation can be arrested and prevented from developing to the musculoskeletal injuries and illnesses thus saving the employees and their employers the trouble of having to deal with these injuries and illnesses.

Such a relationship between exercise and work-related health risks is presented in

Figure 1.1

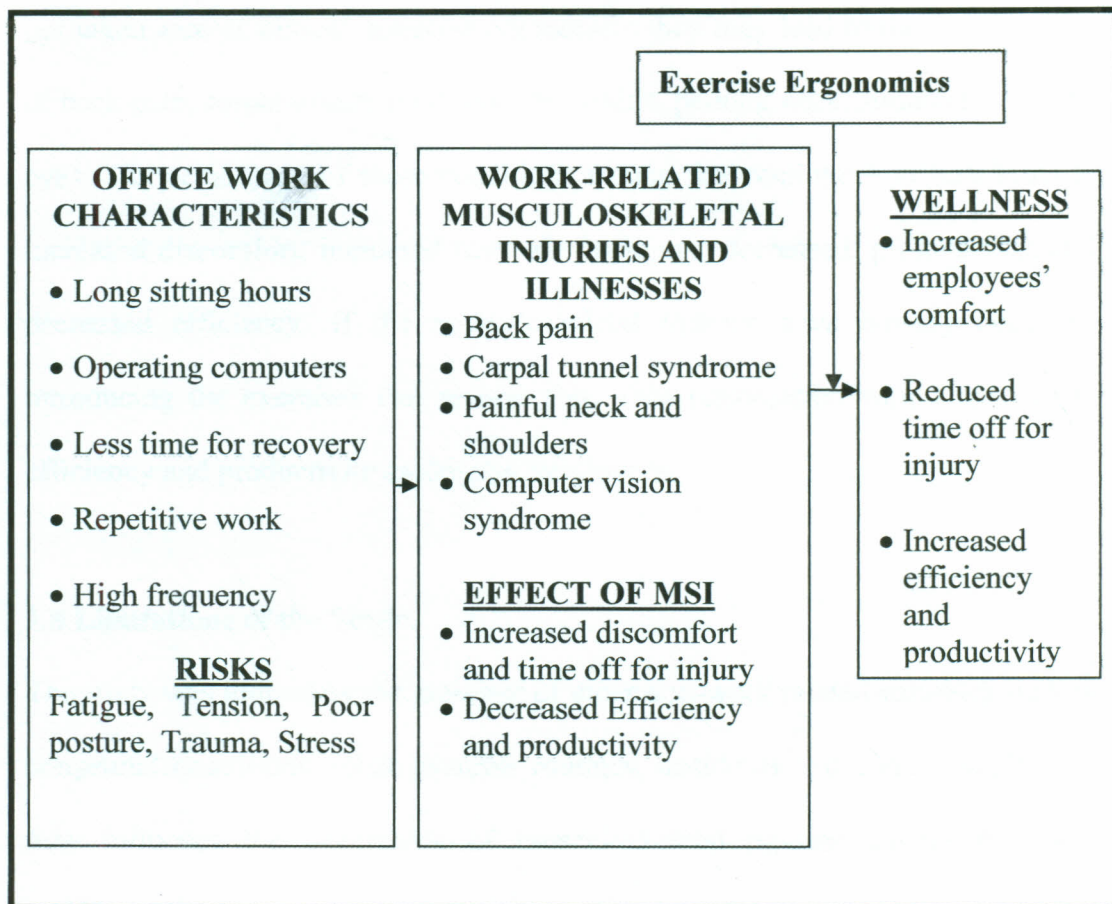


Figure 1.7: Representing the Relationship amongst the Characteristics of Office Work, Work-related Risk Factors, the Work-Related musculoskeletal Injuries and their effects and Exercise Ergonomics and their Effects.

Source: Developed by the Researcher with the Guidance of Supervisors.

As it is shown in figure 1.7 office work is characterized by long sitting hours operating computers, little time for rest and recovery, repetitive work and high

work frequency. This may predispose the bank employees to work-related risk factors such as fatigue, tension, poor posture, trauma and stress. If these risks are not taken care of through exercise ergonomics they may lead to the development of back pain, carpal tunnel syndrome, tendonitis, paining neck, shoulders, and the eyes. The occurrence of these conditions among the employees in turn leads to increased discomfort, increased time off for injury, decreased, productivity, and decreased efficiency. If the musculoskeletal injuries have already occurred, introducing the exercises can reverse this. This intervention would restore the efficiency and productivity among the employees.

1.8 Limitations of the Study.

The study was limited by the presence of other non-work related variables such as congenital conditions, other exercise routines, accidents and dietary habits that may influence the occurrence of musculoskeletal injuries among the bank employees.

1.9 Delimitations of the Study

The study was delimited to bank employees in Kenya commercial bank, Co-operative Bank, Equity Bank, National Bank and the Family Finance Bank in the city center. They included tellers, clerks, secretaries and officers who have worked in the banking industry for at least 1 year. Significant development of musculoskeletal injuries has been recorded in previous studies (Korhonen *et al.*,

2003; Wahlstrom *et al.*, 2007). Therefore employees who have worked for more than one year would have experienced some problems and would provide the required information.

1.10 Assumption of the Study

Bank employees who use computers are in good health but susceptible to musculoskeletal injuries and illnesses.

1.11 Operational Definition of Terms

The following terms are defined as used in the study:

Bank employees: Individuals who work in the banks and spend most of their time seated and operating computers. They included the clerks, tellers, officers, and secretaries.

Banks: they included commercial enterprises such as Kenya Commercial Bank, Co-operative Bank, Equity bank, National Bank and the Family Finance Bank in Nairobi city.

Clerks: Bank employees who mostly keep records about bank clients and offer customer care services.

Ergonomic Exercises: These are stretching exercises performed by the Kenyan bank employees in their work places without requiring them to walk out of their work places.

Ergonomics: The profession of designing machines, tools and work environment in the bank so as to accommodate human performance the best way possible.

Exercise Ergonomics: The field of study that coins exercise to match jobs, systems, and environments considering the physical and mental abilities and limitations of the bank employees in Kenya.

Musculoskeletal Illnesses: Health conditions that may develop among the bank employees as a result of interaction with factors within their workplaces. They include; headaches and neck and shoulder pains, paining eyes and lower back pain.

Musculoskeletal Injuries: these are conditions that may be experienced by bank employees as a result of interaction with factors within their workplaces other than medical factors. They include lower back injuries, carpal tunnel syndrome, neck and shoulder injuries, and computer vision syndrome.

Officers: Computer analysts, credit officers and managerial staff in the mentioned banking institutions.

Posture: The position adopted by bank employees' individual joint or the overall body alignment while operating the computers in the banking institutions in Kenya. Any position deviating from natural body alignment is considered poor posture.

Recovery Period: The period of time between or within cycles, during which the bank employees carry out no repetitive mechanical actions. It consists of pauses

during which the metabolic and mechanical recovery of the muscle can take place.

Secretaries: Bank employees who handle correspondence, and keeps record for the senior bank officers and for the banks and their branches.

Tellers: Bank employees who offer services such as cash deposit and withdrawal to the bank clients over the counters.

Work Environment: The area within which the bank employees work including the equipment and space around them. The equipment may include computers, desks, telephone heads and documents.

Workplace: Banking institutions in which the employees work.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature related to the study and is organized under the following headings: nature of office work, work-related risk factors, ergonomic injuries, ergonomics, exercise ergonomics and related empirical studies.

2.2 Nature of Office Work

Prolonged and continuous sitting, usually in a semi-inactive posture is a common feature among the computer users as the technology and its use is becoming more and more common (Andersen, 2006; New York Reuters Health, 2004). Though computer users spend most of their working hours seated, their muscular systems are involved in frequent movement of the body parts (Graves, 1999). This kind of work is repetitive and requires the employees to work with intense concentration and often at high speed.

The average work environment in the bank cannot suit every worker's needs unless it is completely adjustable, since bank employees have different physical characteristics and require different adjustments to be comfortable (Graves, 1999). Due to this, bank employees are prone to MSI as a result of the mismatch between their physical capacity and the physical requirements of a job since such

a mismatch may force vulnerable individuals into uncomfortable postures such as hunching over, slouching, straining or twisting (New York Reuters Health, 2004).

2.3 Work-Related Risk Factors

Banking is an occupation that demands long periods of sitting and operating the computers and may pose a health problem to the bank employees. The most common risk factors in the banking industry are high frequency in job repetition, awkward posture, direct trauma or contact stress from hard surfaces, inappropriate screen-to-eye distance, lighting, screen brightness, screen flicker rate, prolonged sitting hours, bending and twisting, static or near static work postures, and muscle tension (Bernard, 1997; NIOSH 1997; Ergopro, 2007).

Khan and Siddiqui, (2005) observed that the intra-discal pressure is higher in sitting than in standing position. Also the pattern of weight transmission changes during the inactive, slumpy sitting posture of the computer users causing an excessive abnormal loading of the spine which is a contributory factor for the development of low back pain (Khan and Siddiqui, 2005). During the loading of the spine, the effect of the seating angle is a very important factor in the genesis of low back pain in people who sit for long hours at work. Lumbar disc pressure and electrical activity in the spinal muscles reduces as the seat angle increases (Khan and Siddiqui, 2005). In addition to these, bank employees often hold

individual body parts in poor posture, which may lead to uneven distribution of tension in the body thus leading to injury (NIOSH, 1997).

According to Gales Group Inc, (2001); Graves (1999), and NIOSH, (1997), awkward or non-neutral positions among the bank employees are most common in the following positions:

- i. The neck region, especially when the monitor is above the line of vision.
- ii. Shoulder region, especially when the desk is so high that the shoulders are lifted above their anatomical position.
- iii. The wrists, especially when the desk is so high that the wrists and the arms are not in a straight line; or when one grips the mouse so tightly that tension builds up in the hand and wrist.
- iv. The lower back, mostly when the back support is not adjustable to align with the normal spinal curves especially the lumber curve.
- v. The lower legs and thighs, which is common when the chair is too high or low that the feet and the thighs do not rest comfortably parallel to the floor.

According to National Institute of Occupational Safety and Health (1997), bending or flexion of the trunk, usually in the forward or lateral direction and twisting or trunk rotation is also a source of awkward posture. This is related to bending and twisting in extreme positions or at extreme angles. The risk of suffering from work-related musculoskeletal injuries depends on the speed of

bending and twisting, control in the change of direction or position, and the degree of deviation from the neutral posture (NIOSH, 1997). Bending and twisting are common in the work places since the employees use different equipment or implements often. When they reach for such items they pay little or no attention to their posture thus exposing themselves to injuries.

According to Ergopro (2007), static muscle loading describes muscular activity that focuses on holding an object or on maintaining a certain posture or position that involves little or no movement. Computer ergonomics recognizes that when using the keyboard and mouse, static muscle work is required to hold the arms and hands in place. Furthermore, if the back is not well supported, static muscle activity will occur there and in the muscles of the neck.

Another work-related risk factor is the fact that most of the banking tasks involve the performance of similar activities over and over. This is because the procedure remains the same for a long time. Such high repetitions may force an individual to misuse or over use few body parts (NIOSH, 1997; Bernard, 1997; NIOSH, 1992). Overuse of specific muscles and repetition of certain activities, can carry the risk of straining tissues beyond their normal capacity. Computer ergonomics considers that any repetitive task such as typing, and use of the mouse if performed continuously without sufficient breaks or changes in activity will place demands that may result in a risk of an injury such as carpal tunnel syndrome. In addition,

stress causes increased muscle tension that contributes to the muscle potential for injury, and sensitizes the nervous system that leads to an increased perception of pain (Ergopro, 2007).

Also the employees may develop and adapt one posture in most cases static and a non-neutral. This may eventually lead to the formation and accumulation of stress, muscular tension and fatigue over a long period of time (Bernard, 1997; NIOSH, 1997). Worst still, these similar activities are performed repetitively without breaks leaving no time for recovery from such fatigue and tension making the bank employee even more vulnerable to musculoskeletal injuries and illnesses (NIOSH, 1997; Bernard, 1997). Direct trauma or contact stress is another possible risk factor. Contact stress mostly affects the wrists when the computer user drags the wrists on the wrist pads, desks or the keyboard while keying. This contact stress would be more if the wrists are placed or dragged along hard and sharp edges of the working desks. Other areas affected by contact stress include the back of the knees when the seat pan press against them, the buttocks when the seat pan is not well padded to absorb shock, and the elbows especially when the employees place the elbows on the working desk to improve their view of the screen or to communicate with a customer (Graves, 1999). It may also be experienced on the hamstrings when the seat pan is high such that the bank employees' feet hang instead of resting on and parallel to the floor (Graves, 1999).

Muscular tension may also lead to the development of musculoskeletal injuries and illnesses such as shoulder and neck pains. Muscle tension may result from holding one position for a long time. It is more prevalent because the employees rarely have breaks from their work. The most affected areas are the shoulder region and the neck due to long periods of data entry (Graves, 1999).

2.4 Common Work-Related Musculoskeletal Injuries and Illnesses

Work-related musculoskeletal injuries and illnesses, repetitive strain injuries, cumulative trauma disorders, and repetitive motion injuries are names given to a range of conditions usually caused or aggravated by poor work processes and unsuitable working conditions (Subratty and Korumtollee, 2007). The occurrence of these conditions has been seen to be on the increase.

The most common conditions among the computer users include the following; Lower Back Pain, Carpal Tunnel Syndrome, Neck and Shoulder Pain, and Computer Vision Syndrome.

2.4.1 Lower Back Pain

According to Khan and Siddiqui (2005), the spinal column has protective, supportive and locomotor functions. The vertebrae articulate with each other anteriorly via the intervertebral discs and posteriorly via the facet joints and are made exceptionally strong to withstand the compression forces during axial loading. The mobile segment of the spine i.e. cervical and lumbar region, usually

suffer the most loading stresses. The anterior structures of the spine provide support to the trunk and help in 80% of weight transmission of vertebral loading and keep humans mobile. The posterior structures bear about 20% of weight, and along with the posterior spinal complex provide protection to the neural structure and determine the direction of movement. It has been observed that if the synovial facet joints were static, the intervertebral discs would wear out rapidly as a result of rotational and torsional stress leading to back problems.

There are many conditions in the lower back which may cause back pain, including muscular or ligamentous strain, facet joint arthritis, or disc pressure on the annulus fibrosis, vertebral end-plate, or nerve roots. Muscle strain is probably the most common type of work or non-work related back pain (NIOSH, 1997). Prolonged, continuous sitting, in an inactive posture is a common feature among the computer /video display unit (VDU) users as the technology and its use is becoming more and more common (Khan and Siddiqui, 2005). Contrary to the popular belief that sitting is relaxing, it is hard on the back. Sitting for long periods of time in office chairs can cause lower back pain or worsen an existing back or neck problem. This is because sitting in static posture increases stress in the back, neck, shoulders, arms and legs. This can cause increased pressure on the intervertebral discs, which are the springy, shock-absorbing part of the spine, and can add large amounts of pressure to the back muscles. Moreover, when sitting in an office chair for a long period, the natural tendency for most people is to slouch

over or slouch down in the chair, and this posture can overstretch the spinal ligaments and strain the discs and surrounding structures in the spine. Over time, incorrect sitting posture can damage spinal structures and contribute to or exacerbate recurrent episodes of back pain (Triano, 2005).

In addition, gravity tends to pool blood in the legs and feet and create a sluggish return to the heart in addition to increased intra discal pressure. The pattern of weight transmission changes during the inactive, slumpy posture of the computer users causing an excessive abnormal loading of the spine contributing to the development of low back pain (Khan and Siddiqui, 2005).

During the past few years a new class of young sedentary back pain sufferers has been emerging. They are usually in professions where prolonged sitting is essential like bank clerks, accountants, stock exchange workers, and industrial workers (Khan and Siddiqui, 2005). Lower back pain in computer users is more common in the younger age group, with a second surge especially at the beginning of their career at the age of 25 (Khan and Siddiqui, 2005). Working for long in faulty position; inappropriate ergonomics, old age and lack of physical exercises result in laxity of ligaments that also contributes to the development of back pain (Khan and Siddiqui, 2005). Studies of workers' compensation data have suggested that lower back pain represents a significant portion of sickness in the

working populations. Data indicate that back pain claims account for 16% of all workers' compensation claims and 33% of total claims costs (NIOSH, 1997).

2.4.2. Carpal Tunnel Syndrome

The carpal tunnel is a narrow, rigid passageway in the wrist and palm for nerves and tendons of the forearm and hand. One of these nerves is the median nerve which controls sensations to the palm side of the thumb and fingers, as well as impulses to some small muscles in the hand that allow the fingers and thumb to move (National Institute for Occupational Disorders and Stroke, 2007; Daniels, 1996). When the nerve is irritated, it may lead to the development of carpal tunnel syndrome, which is a compression of the median nerve in the wrist. Carpal tunnel syndrome is often the result of a combination of factors that increase pressure on the median nerve and tendons in the carpal tunnel (National Institute for Occupational Disorders and Stroke, 2007; Daniels, 1996). The most likely contributing factors include; congenital predisposition, trauma or injury to the wrist, mechanical problems in the wrist joint, work stress, repeated use of vibrating hand tools, or the development of a cyst or tumor in the canal and thickening of irritated tendons (National Institute for Occupational Disorders and Stroke, 2007; New York Reuters Health, 2004).

Symptoms usually start gradually, with frequent burning, tingling, or itching numbness in the palm and the fingers, especially the thumb and the index and

middle fingers. Some carpal tunnel syndrome sufferers say their fingers feel useless and swollen, even though little or no swelling is apparent. The symptoms often first appear in one or both hands during the night, since many people sleep with flexed wrists. As symptoms worsen, people might feel tingling during the day. Decreased grip strength may make it difficult to form a fist, grasp small objects, or perform other manual tasks. In chronic and/or untreated cases, the muscles at the base of the thumb may waste away (National Institute for Occupational Disorders and Stroke, 2007; New York Reuters Health, 2004).

Although painful sensations may indicate other conditions, carpal tunnel syndrome is the most common and widely known of the entrapment neuropathies in which the body's peripheral nerves are compressed or traumatized (National Institute for Occupational Disorders and Stroke, 2007). There is little clinical data to prove whether repetitive and forceful movements of the hand and wrist during work activities can cause carpal tunnel syndrome. Repeated motions performed in the course of normal work or other daily activities can result in repetitive motion disorders such as bursitis and tendonitis. According to National Institute for Occupational Disorders and Stroke (2007), in 1998 an estimated three of every 10,000 workers lost time from work because of carpal tunnel syndrome. Half of these workers missed more than 10 days of work. The average lifetime cost of carpal tunnel syndrome, including medical bills and lost time from work, was

estimated to be about \$30,000 for each injured worker (National Institute for Occupational Disorders and Stroke, 2007).

Women are three times more likely than men to develop carpal tunnel syndrome, this could be because the carpal tunnel may be smaller in women than in men. Also the muscular protection around the wrists of the female could be narrower and softer than those of men since men are more masculine. This exposes the medial nerve to contact stress. The dominant hand is usually affected first and produces the most severe pain (National Institute for Occupational Disorders and Stroke, 2007).

2.4.3 Neck and Shoulder Pain

Neck and shoulder pain are among the most prevalent disorders, 76% and 75.5%, respectively (New York Reuters Health, 2004). Studies have shown that computer users are at increased risk of having such symptoms. Neck and shoulder pain could be caused by poor workstation position including sitting posture, monitor position, screen height, flexion of the head to avoid glare and keyboard height. In addition to the factors above, frequent computer use that involves awkward postures, repetition and forceful exertions may be related to nerve, muscle, tendon and ligament damage in the neck and shoulders. Due to these factors, most computer users try to hold their heads at an incorrect angle causing muscular fatigue and cramps in the neck and shoulder muscles (New York Reuters Health, 2004).

Symptoms of this problem may include, tingling in the extremities, numbness in the fingers, sore wrists, lower back pain or eyestrain (New York Reuters Health, 2004). One may also develop general aches and pains in the neck, shoulders, arms, back, thighs and lower legs, or persistent pain or discomfort in muscles, tendons and other soft tissue (New York Reuters Health, 2004). Neck and shoulder pain and stiffness are widespread among computer users. According to New York Reuters Health (2004), more than half of computer users each year develop neck or shoulder symptoms and just over one-third develop impairment or the loss of some function. Women are more likely to report symptoms and develop disorders than men are. However, the reasons for this finding are unclear (Andersen *et al.*, 2006).

2.4.4 Computer Vision Syndrome

According to Grossman (2006), humans are born to have hunters' eyes, needed for spotting game or danger at a distance. But during the last 50 years nearly all our work and much of our recreation, for example, video games, has shifted the focus of our vision to arm's length (Grossman, 2006). Normally, when we read or do other close work, we hold the material in our laps, as when we read a book or a magazine thus our eyelids cover most of the surface of our eyes, so the tear film does not evaporate rapidly. Looking at a computer, however, typically means looking straight ahead, not down. More of our eye surface is exposed, and the tear film can evaporate, causing a dry, burning, gritty sensation. Blink rate can affect

our comfort level, too. In order to see the screen clearly, computer users move their shoulders, heads, and neck, or hunch forward. Often, they don't realize their postures have deteriorated until they feel the muscular strain. This results in tight, strained muscles in the shoulders and back. Often, the wrong symptoms are treated. If the eyes are not treated, the back and shoulder pain will become progressively worse (Torrey, 2003).

Computer vision syndrome is not widely known yet it is more widespread (Torrey, 2003). This condition is marked by such changes as nearsightedness, suppressed vision in one eye, poor eye teaming, reduced efficiency at work and at play, eyestrain, tired, burning eyes, headaches, blurred vision, neck and back pain, and muscle spasms. It affects those who work at a computer for long (Torrey, 2003). Studies have long shown that the computer screen is a very different visual environment from the printed page. Poor definition of images on the screen compared with the clarity of a printed page causes the eyes to work harder. This forces the eye muscles to refocus continuously and subconsciously while one looks at the computer screen. This effort can amount to thousands of focusing cycles in a typical workday. Over time it creates the various symptoms known collectively as eyestrain (Torrey, 2003). Often, ergonomic challenges compound the problem further, due to limitations on placement of the monitor, increased susceptibility to glare, and poor selection of eyeglass lenses for computer use, increase in the number and complexity of necessary eye movements and focusing

skills, poor lighting conditions, and distracting reflections, screen flicker rate, and above all, the extended amount of computer use (Grossman, 2006).

More than 50 percent of computer users experience eyestrain, headaches, blurred vision and other visual symptoms related to sustained use of the computer. This type of stress on the visual system can also cause body fatigue and reduced efficiency at work (Grossman, 2006). The U.S. Bureau of Labor Statistics reported in 1998 that more than 75 million workers sit at computers every day. More than 70 percent of these people are affected in some way by computer vision syndrome (Torrey, 2003).

2.5 Ergonomics

Redesigning tools or workstation to reduce the risk factors as well as providing specific training in risks avoidance and adjustment procedures are considered central to the prevention of MSI (National Institute of Occupational Safety and Health, 1997). This is possible through ergonomics; the profession of designing machines, tools and work environment to best accommodate human performance. The word ergonomics is derived from two Greek words "ergon", which means work and "nomoi", which means natural law. Ergonomics consult four different scientific fields to measure the physical characteristics of people and their responses to their environments with reference to health and performance (Britannica, 2006; Pulat, 1992; McCormick, 1993; National Institute of

Occupational Safety and Health, 1997; Europro, 2007). One of these is anthropometry that relates to computer ergonomics as it is the science that studies and measures all of our body parts so that products, furniture and workstations can be designed to fit different sizes of people (Europro, 2007).

Biomechanics, the science that uses the laws of physics and engineering to describe how our muscles and skeleton react when we use various forces and weights on them has important contribution to computer ergonomics (Europro, 2007). Work physiology that is the science that studies information about what type and how much activity the body's circulatory, respiratory, digestive, and the musculoskeletal systems can endure before they get overworked and tired or fatigued. Psychology is the other scientific field; psychological data is used to make sure that what is designed does not overwhelm our minds and behavior (Europro, 2007). Computer ergonomics incorporates information in designing equipment for the workplace intended to maximize productivity and reduce worker fatigue and discomfort (Europro, 2007).

Ergonomics therefore aims at improving the practicality, efficiency and safety of a person (Britannica, 2006; Pulat, 1992; McCormick, 1993; and NIOSH, 1997). Computer ergonomics is important to anyone who uses the computer for work or recreational activities. Frequent and long periods spent sitting at a computer workstation can have a lasting, detrimental effect on physical and mental

wellbeing. Computer ergonomics responds to the fact that an office worker, throughout his career, spends 80,000 hours sitting at a desk and this is increasing. The fact that cumulative trauma disorders, defined as physical injuries that develop gradually over a period because of repeated biomechanical and physiological stresses on a specific body part, have risen dramatically over the years is certainly related, and computer ergonomics seeks to reverse this trend (Andersen, 2006; Europro, 2007).

Attention to ergonomics helps to reduce workplace injuries and illnesses that would otherwise result in workers' compensation cost, medical claims and lost work time. Some solutions can be as simple as rearranging a work space, moving the work area higher or lower or closer, placing tools within easy reach, and keeping the working space directly in front of body. In addition, frequently used items should be placed within an easy reach (New York Reuters Health, 2004; Hajic, 2007). Much suffering and cost is avoidable through good computer ergonomic workplace design, teaching employees the basic principles of computer ergonomics and computer workstation ergonomics, providing ergonomic computer furniture, and ergonomic computer accessories and encouraging good work habits, such as frequent breaks (New York Reuters Health, 2004). Below are some ergonomic adjustments.

Awkward Positioning involves overuse of isolated body parts during repetitious routine tasks such as typing, data entry, awkwardly reaching to transfer documents or answer phones (Kohler, 1994). For office workers, this means using the body the wrong way, since it is designed for constant movement using a wide variety of postures. When workers use computers, their bodies are held in unnaturally near-static positions for hours. These postures and low overall physical activity that are common among office workers intensify the harmful effects of repetitive tasks. The best way to counteract the damaging effects of prolonged computer use would be through breaks, often task rotation, taking a walk to the copy machine; walking down the hall to discuss an item with a co-worker rather than using email or calling which off-set harmful effects from improper use of the body (Hajic, 2007).

The use of bifocals increases the risk of neck strain and headaches as bifocal wearers often bend their necks forward and tilt their heads back to read the screen. If an employees needs to wear corrective lenses, he or she should consider having a pair that is prescribed specifically for computer use with the monitor positioned about an arm's length. This would ensure that the employee retains an upright sitting posture away (Hajic, 2007).

According to Triano (2005), an ergonomic office chair is a tool that, when used properly, can help one maximize back support and maintain good posture while

sitting. However, simply owning an ergonomic office chair is not enough. It is also necessary to adjust the office chair to the proportions of the individual's body to improve comfort and reduce aggravation to the low back and neck while sitting. Before adjusting an office chair, the user should first establish the desired height of his or her desk or workstation. This decision is determined primarily by the type of work to be done and by the height of the user. The height of the workstation can vary greatly and will require different positioning of the chair (Triano, 2005). Office chairs should have a five-point base for stability and casters for easy movement. The seat height should be adjustable to position feet flat on the floor. If the chair needs to be raised to adjust for desk or work-surface height, a footrest should be used to support the legs. The chair should provide support for the lower back. The seat pan should be deep enough and wide enough to support the body (NIOSH, 1997; Graves, 1999; Grossman, 2006; Hajic, 2007). Adjustments for pan tilt can provide for changes in positioning from a slight recline to neutral to allow for changes throughout the day. There should be some space between the back of the knees and the edge of the chair to allow for good circulation to the legs and reduce pressure points. Arm rests should be adjustable for height so that the shoulders are relaxed and also be short enough to clear the desk so the keyboard can be easily accessible without reaching forward (NIOISH, 1997; Graves, 1999; Grossman, 2006; Hajic, 2007).

The desk should be of appropriate height to support work tasks. Most desks are too high for typing tasks (Hajic, 2007; National Institute for Occupational Health and Safety, 1997). Many people may be most comfortable when the height of their desks is about elbow level when sitting down (New York Reuters Health, 2004). A sliding keyboard tray positioned underneath the desk may be necessary to lower the keyboard to a good typing height. When typing, the shoulders should be relaxed, the elbows resting at the body sides, and the forearms parallel to the floor or slightly slanted down (Hajic, 2007; National Institute for Occupational Health and Safety, 1997). In addition, one should check that there is enough room below the desk to comfortably fit the knees and thighs (New York Reuters Health, 2004). The desktop should be organized so that frequently used objects are close to the user to avoid excessive extended reaching. If a document holder is used, it should be placed at approximately the same height as the monitor and at the same distance from the eyes to prevent frequent eye shifts between the screen and reference materials (Anderson and Anderson, 2002).

Forearms-typically when typing at the keyboard or using a mouse, the forearms are in a palm down, or pronated, position. The neutral position is with the forearm rotated so that the thumbs are up and the palms face towards each other. Some split keyboards allow for each half of the keyboard to be elevated so that an upside down v-shape is formed. This rotates the forearms into a more neutral

position. Vertical mice also help to position the forearms in a neutral position (Hajic, 2007).

Staring at a monitor for long lengths of time can cause eyestrain. Reduce glare by positioning the workstation perpendicular to windows. Use task lights rather than overhead lights. Clean the monitor screen regularly and adjust the color and contrast so that print is easily read (Hajic, 2007).

When speaking on the phone for any length of time, or when performing simultaneous keyboard and phone tasks, it is important to use a headset for proper neck positioning. A headset also eliminates nerve tension commonly caused by holding the elbow for any length of time in a bent position (as when holding the phone to the ear) (Hajic, 2007).

When performing repetitive or stressful work one should rotate the type of work to reduce the risk of repetitive strain injuries. Take frequent mini-breaks or working breaks (such as walking to the copier or consulting with a co-worker in person rather through e-mail) (Hajic, 2007).

Positioning of the wrists into ulna deviation can lead wrist pain (when the wrist is angled toward the small finger side). Ulna deviation can be caused by a small keyboard, a large elbow carrying-angle (the angle of the forearm bones in relation to the upper arm bone when the arm is hanging down at your side with the palms

facing forward) or by arm positioning around a larger body. Split keyboards adjust for ulna deviation and position the wrists in a more neutral position (wrists flat and straight not bent forward or back or angled to either side). The keyboard should be tilted to help the wrist stay straight, which is to say raising the space bar end and lowering the "top"(the F1, F2 etc.) end and centered in front of your body (New York Reuters Health, 2004).

Most people have their monitors down, below the level of their eyes and this puts strain on the back of your neck as your head lowers to look at the screen. To reduce the risk of neck pain, the monitor should be positioned directly in front of the keyboard. The monitor should be at eye level or slightly above about one arm's length (20-26 inches) away, so the head can balance without using hardly any muscles to keep them up. This allows for a neutral neck position and reduces eyestrain. In addition to the above measures, adjust brightness and contrast to optimum comfort, position the monitor at right angles from windows to reduce glare, position monitors away from direct lighting which creates excessive glare or use a glare filter over the monitor to reduce glare. Correct placement of your monitor may help some individuals prevent eyestrain, neck pain and shoulder fatigue by keeping your head and neck as straight as possible (Anderson and Anderson, 2002).

The neck should be in a neutral position with the shoulders relaxed. Neck strain may develop if you consistently look to one side or the other (such as when the

monitor is not placed directly in front of the keyboard) or if you work from copy. To avoid frequently looking up and down from copy to the monitor, use a copyholder so that the copy is on the same level as the monitor. If you consistently work with copy, place a copyholder on each side of the monitor to vary neck movement between pages (Hajic, 2007).

Overuse injuries occur when the daily micro-trauma from normal wear-and-tear exceeds the body's ability to heal during rest periods. Cumulative trauma disorders, repetitive strain injuries, work-related musculoskeletal disorders, and occupational overuse injuries are all terms that describe this same type of injury. These are general terms for the type of injury rather than a specific diagnosis (Hajic, 2007).

Wrist rests-wrist rests help position the wrist in a neutral position while typing. Unfortunately, the term implies that the wrist is resting down on the pad. The wrist should actually glide over the rest with the movement of the hand initiated from the shoulder. Planting the wrist on the wrist rest places pressure against the carpal tunnel and overuses the small muscles of the wrist and fingers (Hajic, 2007).

Lighting not suited to working with a Video Display Terminal is a major contributing factor in visual discomforts including eyestrain, burning or itching

eyes, and blurred or double vision. According to the American National Standards Institute (ANSI), typical office environments have illumination levels higher than necessary (Anderson and Anderson, 2002). Sometimes the background behind the monitor can also cause eyestrain. For example if it is a bright window, may have eye fatigue from trying to focus out the light. One should adjust lighting to avoid glare on screen by placing the source of light at a 90 degree angle, with low watt lights rather than high, place the monitor at 90 degree angle to windows where possible, avoid or reduce overhead lighting where possible, use indirect or shielded lighting where possible, paint walls with medium or dark color and not have reflective finish, and use a glare screen to reduce glare (Anderson and Anderson, 2002).

2.6: Exercise Ergonomics

No matter how comfortable an individual may be in the office chair, prolonged and static posture is not good for the back and is a common contributor to back problems and muscle strain (Triano, 2005). The human body is not designed to sit still for long periods of time even in correct position therefore regular pauses are not a waste of time. Efforts have been made to correct the situation by the introduction of ergonomics. Though ergonomics reduces the risk of musculoskeletal injuries and illnesses at a work place, its effectiveness is limited. Exercise is the best way to prevent musculoskeletal injuries and illnesses. Ergonomics should therefore be combined with exercises in order to achieve the

best results (NIOSH, 1997). Exercises performed at the workplace are called ergonomic exercises and are recommended for computer users throughout the day. When muscles remain stationary for some time, circulation decreases, muscles tire and tasks become more uncomfortable for the computer users to perform. Incorrect computing postural habits combined with long-term stationary sitting are considered factors of work-related musculoskeletal injuries and illnesses and may be avoided by performing simple exercises during the day (Anderson and Anderson, 2002; NIOSH, 1997).

Individuals throughout the day can easily schedule short periods of office exercises. Micro-breaks and rest exercise breaks as well as eye breaks can be scheduled at specific intervals during the day (Daniels, 1996; NIOSH, 1997). Some activities can easily be performed by individuals at their desk and only could take a minute or two. They fit easily in-between tasks and provide long-term benefits for employees' health and productivity. Ergonomic exercises should be planned with micro breaks and rest breaks to facilitate movement that is necessary for the well being of the employees. 30 to 60 second micro-breaks can be taken every 30 minutes. These don't take long and they don't take one away from the desk, but they do also provide the eyes a break from staring at the computer screen (NIOSH, 2007; Grossman, 2006) Office exercise rest breaks should be taken after every one or two hours of stationary computer work. These one to two minute exercise breaks incorporating movement and stretching help prevent the

symptoms of work-related musculoskeletal injuries (Anderson and Anderson, 2002; Fenety and Walker, 2002; Grossman, 2006).

Stretching and exercising the muscles throughout the day help maintain the body's health. However, stretching exercises should not be painful; slow and easy is all that's required (Anderson and Anderson, 2002; Fenety and Walker, 2002). Individuals who are already suffering from the effects of work-related musculoskeletal injuries should consult with their physicians prior to taking up specific preventative-style exercises. “. ...*An ounce of prevention is worth a pound of cure*” (Anderson and Anderson, 2002). Some of the exercises that may be performed by bank employees during their official working hours are presented in appendix F.

2.7 Empirical Studies on Exercise Ergonomics

Kietrys *et al.*, (2007) conducted a study on the effects of at-work exercises on computer operators and assessed adherence, pain and satisfaction after 4 weeks of at-work exercise using a randomized control trial. Seventy two subjects were randomized into 3 groups: resistance exercise, stretching, and control. Outcomes included a satisfaction survey, a visual analogue pain scale (VAS), a pain drawing, and the Neck Disability Index (NDI). The VAS, the drawing, and NDI were analyzed together as a composite variant referred to as Pain Impact. Exercise frequency was similar across the 3 groups (median=1.5 times per day). They

found no differences between groups on Pain Impact $p=0.714$) or individual pain variables. Most satisfaction survey item scores did not differ between groups. However, a significant difference between groups on the survey item related to discomfort. The resistance and stretching group differed from the control group with regard to their perception that the exercises were helpful in reducing discomfort in the back and neck ($p<0.001$). They concluded that most subjects found the resistance and the stretching exercises easy to do; they performed them 1 to 2 times in a day, and said they reduced discomfort.

Subratty and Korumtollee (2007) in their study "Occupational Overuse Syndrome among Keyboard Users in Mauritius" assessed reporting of occupational overuse syndrome (OOS) among keyboard users in Mauritius. A questionnaire-based survey was carried out among 362 computer users. 200 completed questionnaires were returned and data analyzed. The main findings showed symptoms such as eye problems and lower back, neck and shoulder pain were common among computer users. Severity of pain increased with number of hours of computer use at work. Reporting of OOS was higher among females. They concluded that computer users needed to be provided with an ergonomically conducive environment as well as to be educated and trained with respect to OOS. Implementation of such program(s) would go a long way towards preventing appearance of OOS symptoms among the young population currently engaged in the IT sector in Mauritius.

Wahlstrom *et al.*, (2007) in their study “Perceived Muscular Tension, Job Strain, Physical Exposure, and Associations with Neck Pain among VDU Users; a Prospective Cohort Study” sought to determine whether perceived muscular tension, job strain, or physical exposure were associated with increased risk of developing neck pain among Visual Display Unit (VDU) users. 1283 respondents, of whom 671 were free from neck pain answered a questionnaire. Perceived muscular tension, job strain, and physical exposure were assessed at baseline. Information about newly developed neck pain was collected in 10 follow up questionnaires and the case definition was the first report of such pain in any of the follow up questionnaires. Median follow up time was 10.9 months. They reported that both men and women who perceived muscular tension at least a few times per week, compared to those who had not perceived muscular tension the preceding month and had an incidence rate ratio (IRR) of 95% for developing neck pain, when stratifying for sex. High-perceived muscular tension was associated with an increased risk (95%) even when controlling for job strain, physical exposure, and age in the model stratified by sex. They concluded that perceived muscular tension was associated with an increased risk of developing neck pain among VDU users.

Barredo and Mahon (2007) in the study “The Effects of Exercise and Rest Breaks on Musculoskeletal Discomfort during Computer Tasks: An Evidence-Based Perspective” set out to review the strength of research evidence on the effects of

exercise and rest breaks on musculoskeletal discomfort during computer tasks and compare the evidence with clinical guidelines. Articles from Pubmed, Ovid and references of relevant articles were reviewed for research design and internal validity. Grades of evidence were assigned based on the aggregate strength of articles for each intervention. They reported that fifteen articles (one on exercise, seven on rest breaks, five examining both) met the inclusion criteria. Exercise and rest breaks were each assigned a grade of C. In conclusion they noted that evidence supports the use of exercise and rest breaks in reducing musculoskeletal discomfort in computer tasks. The research evidence suggests no additional benefits of exercise over rest breaks alone.

Gerr *et al.*, (2006) in their study “Keyboard Use and Musculoskeletal Outcomes Among Computer Users” reviewed epidemiological evidence examining associations between upper extremity musculoskeletal symptoms and disorders and keyboard use intensity (hours of computer use-per day or per-week) and computer user posture. A literature search was conducted to identify papers published in the peer-reviewed medical literature between 1966 and November 2005. A total of 558 citations were found and reviewed. Those papers in which associations between musculoskeletal outcomes and (1) posture (ascertained by a study investigator) or (2) computer use, in units of hours-per-day, hours-per-week, or as a percent of work-time, were included in the review. 39 epidemiological studies examining associations between computer use and MSD

outcomes were identified. While the observational epidemiological literature was heterogeneous, some trends emerged. It appeared that the most consistent finding was the association observed between hours spent keying and hand/arm outcomes. Associations between some postural effects and musculoskeletal outcomes were inferred from the literature. In particular, placing the keyboard below the elbow limiting head rotation, and resting the arms appears to result in reduced risk of neck/shoulder outcomes. Minimizing ulna deviation and keyboard thickness appeared to result in reduced risk of hand/arm outcomes. They concluded that several methodological limitations, including non-representative samples, imprecise or biased measures of exposure and health outcome, incomplete control of confounding, and reversal of cause and effect, might have contributed to the heterogeneity of observed results.

Khan and Siddiqui (2005) in their study "Prevalence of Low Back Pain in Computer Users" sought to study the prevalence of low back pain in computer users and how different age groups behaved under prolonged sitting posture on axial loading against time. A multi-center cross sectional Survey among students of computer institutes and the data from hospital base practice in the city of Karachi by initial screening questionnaire followed by further clinical examination and evaluation was conducted. The main out come measures were variation in the pattern of low back pain in response to duration of work, age and gender against time. Results showed that Low back pain in computer users was

more common in the younger age group (16-18 yrs) with a second surge (23-30 yrs) specially at the beginning of their carrier with a prevalence rate of 6.7%, mean age 30.29, std. deviation 12.744 and frequency of male to female 223:95, novice to professional 182:136, single married 192:127, about 44% of VDU users developed LBP in 4 hours and 35% in 3 hours about 50% of them found to have lax muscles. In conclusion they noted that Low back pain was a common condition in computer users in all age groups. Working for long hours in faulty position; inappropriate ergonomics, old age and lack of physical exercises resulted in laxity of ligaments that are the main causes of back pain. Symptomatic conservative treatment with NSAIDS, muscle relaxant and regular back muscle exercises are extremely helpful.

Balci and Aghazadeh, (2004) investigated three work-rest schedules: 60- min work/10-min rest, 30-min work/5-min rest, and for the third schedule, the participants received four breaks from each hour in addition to a 14-min break after 2 hours (three of the breaks were 30 sec long and the fourth was 3-min in length). The study also considered the effect of the type of task. Participants were asked to enter alphanumerical data as a data entry task and to solve addition/subtraction problems as a cognitive task. The results indicated that the effect of work-rest schedule was significant on various perceived discomfort categories and the performance of the subjects. Similarly, the type of task had significant affects on discomfort, performance, and muscular load levels. The

15/micro schedule was superior to the other schedules in terms of discomfort levels of the neck, back, and elbow/arm, eyestrains, speed, accuracy, and performance for both tasks. The lowest levels of trapezius muscle tension for data entry and flexor carpi radialis for the cognitive tasks obtained with 15-min micro schedule.

Omer *et al.*, (2004) in their study “Musculoskeletal system disorders in computer users: Effectiveness of training and exercise programs” investigated the effect of Cumulative Trauma Disorders (CTD) on daily life and the effectiveness of training and exercise programs in the management of these disorders at a state department where computers were widely used. 50 patients with CTD between the ages 25 and 50 were recruited for the study and were randomized into two groups. The complaints of patients with CTD had appeared after they had started working in this job and they reported that their complaints were related to their occupation. The patients complained of head, neck, shoulder, back and wrist pains and most of them were diagnosed as Myofascial Pain Syndrome (MPS) and Carpal Tunnel Syndrome (CTS). The first group was given mobilization, stretching, strengthening and relaxation exercises five days a week for a period of two months following a training course. The second group was given a training course only. Both groups were assessed in terms of the following outcome criteria before and after the treatment: Numeric Rating Scale (NRS) and Pain Disability Index for pain; Tiredness Scale for tiredness; and Beck Depression Scale for

depression. At 2 months, the treatment group was observed to have experienced statistically significant improvements in NRS ($p < 0.001$), pain disability index ($p < 0.05$) and Beck depression scale ($p < 0.05$) values as compared to the control group. Mobilization, stretching, strengthening and relaxation exercises reduce pain and depression levels of CTD patients in the short term.

Hagberg *et al.*, (2004) in their study “Self-Reported Reduced Productivity Due to Musculoskeletal Symptoms: Associations with Workplace and Individual Factors among White-Collar Computer Users” assessed whether self-reported reduced productivity occurred in computer users due to musculoskeletal symptoms and the association to workplace, symptom, and individual factors. The study group consisted of 1283 computer users from different occupations, of whom 498 were men and 785 were women. Reduced productivity was self-assessed by two questions addressing if and how much productivity was reduced due to musculoskeletal symptoms. 63 women (8.0%) and 42 men (8.4%) of the total study group reported reduced productivity due to musculoskeletal symptoms. The mean magnitude of the reduction was 15% for women and 13% for men. This outcome was weakly associated with computer mouse position and task and symptom persistence for both men and women. For women, work demands, computer problems, and being divorced or separated were also associated with reduced productivity. Although limited by problems of subjectivity of self-report and the possibility of significant underreporting, the results suggested that a

variety of interventions might serve to decrease the impact of musculoskeletal disorders in the workplace.

Gerr *et al.*, (2004) in their study “Epidemiology of Musculoskeletal Disorders among Computer Users: Lesson Learned from the Role of Posture and Keyboard Use” reviewed the epidemiological evidence examining associations between Musculoskeletal Disorders (MSD) outcomes and computer user posture and keyboard use intensity (hours of computer use per day or per week). They pointed out that results of epidemiological studies of posture and MSD outcomes have not been entirely consistent. Despite the inconsistencies, it appeared that posture was an independent risk factor of modest magnitude for MSD among computer users. Also, lowering the height of the keyboard to or below the height of the elbow and resting the arms on the desk surface or chair armrests was associated with reduced risk of neck and shoulder MSD. Results of epidemiological studies examining computer use (hours keying per day or per week) were more consistent than those examining posture, although some inconsistency was observed. Overall, the literature showed that daily or weekly hours of computer use were more consistently associated with hand and arm MSD than with neck and shoulder MSD.

Juul-Kristensen *et al.*, (2004) conducted a study to determine factors of computer work that predict musculoskeletal symptoms in the shoulder, elbow, and low-back regions. A questionnaire on ergonomics, work pauses, work techniques, and

psychosocial and work factors was delivered to 5033 office workers at baseline in early 1999 and to 3361 respondents at the time of the follow-up in late 2000. An increased frequency or intensity of symptoms was the outcome variable, including only non-symptomatic respondents from the baseline questionnaire. In the follow-up, 10%, 18%, and 23% had symptoms more often in the elbow, shoulder, and low back, respectively, and 14%, 20%, and 22% had more intense symptoms. Women were more likely to be afflicted than men in all regions. In the full-fit multivariate logistic regression analysis, little influence on the timing of a rest pause and being disturbed by glare or reflection were significant predictors of shoulder symptoms, screen below eye height was a significant predictor for elbow symptoms, and previous symptoms was a significant predictor for symptoms in all regions. Computer work-time and psychosocial dimensions were not significant predictors. They noted that work pauses, reduction of glare or reflection, and screen height are important factors in the design of future computer workstations.

Korhonen *et al.*, (2003) conducted a research on Work related and individual predictors for incident neck pain among office employees working with video display units. 515 employees in three administrative units of a medium sized city in Finland received mailed questionnaires in the baseline survey in 1998 and in the follow up survey in 1999. Response rate for the baseline was 81% (n = 416); respondents who reported neck pain for less than eight days during the preceding 12 months were included into the study group as healthy subjects (n = 232). The

follow up questionnaire 12 months later was completed by 78% (n = 180). Incident neck cases were those reporting neck pains for at least eight days during the preceding 12 months. The annual incidence of neck pain was 34.4%. Poor physical work environment and poor placement of the keyboard increased the risk of neck pain. Among the individual factors, female sex was a strong predictor. Smoking showed a tendency for an increased risk of neck pain. There was an interaction between mental stress and physical exercise,; those with higher mental stress and less physical exercise having especially high risk. They concluded that in the prevention of neck disorders in office work with a high frequency of VDU tasks, attention should be given to the work environment in general and to the more specific aspects of VDU workstation layout. They also suggested that physical exercise may prevent neck disorders among sedentary employees.

Hoogendoorn *et al.*, (2002) in their study “High Physical Work Load and Low Job Satisfaction Increase the Risk of Sickness Absence due to Low Back Pain” sought to determine whether physical and psychosocial load at work influence sickness absence due to low back pain. The research was a part of the study on musculoskeletal disorders, absenteeism, stress, and health (SMASH), a 3-year prospective cohort study on risk factors for musculoskeletal disorders. Workers from 21 companies located throughout The Netherlands participated in the part of the study on sickness absence due to low back pain. The population consisted of 732 workers with no sickness absences of 3 days or longer due to low back pain in

the 3 months before the baseline survey and complete data on the reasons for absences during the follow up period. The mean period of follow up in this group was 37 months. Physical load at work was assessed by analyses of video recordings. Baseline information on psychosocial work characteristics was obtained by a questionnaire. Data on sickness absence were collected from company records. The main outcome measure was the rate of sickness absence of 3 days or longer due to low back pain during the follow up period. After adjustment of the work related physical and psychosocial factors for each other and for other potential determinants, significant rate ratios ranging from 2.0 to 3.2 were found for trunk flexion, trunk rotation, lifting, and low job satisfaction. A dose-response relation was found for trunk flexion, but not for trunk rotation or lifting. Non-significant rate ratios of about 1.4 were found for low supervisor support and low coworker support. Quantitative job demands, conflicting demands, decision authority, and skill discretion showed no relation with sickness absence due to low back pain. In conclusions they noted that flexion and rotation of the trunk, lifting, and low job satisfaction are risk factors for sickness absence due to low back pain. Some indications of a relation between low social support, either from supervisors or coworkers, and sickness absence due to low back pain were also noted.

Fenety and Walker (2002) conducted a study on "Short-Term Effects of Workstation Exercises on Musculoskeletal Discomfort and Postural Changes in

Seated Video Display Unit Workers” They tested the hypothesis that doing regular, short-term (<10 days) exercises while at a workstation would decrease musculoskeletal discomfort and increase In-Chair Movement (ICM). Eleven directory assistance operators (8 female, 3 male) with no recent history of musculoskeletal problems were utilized for the study. In-chair movement was measured by tracking the center of pressure at the buttock-chair interface as subjects sat on a pressure-sensitive mat. Musculoskeletal discomfort was rated through the use of the Body Part Discomfort Scale (BPDS) and a body map. They also used a revised data span exercise program for their study. The subjects were tested for 2 hours, on 2 occasions, before and after doing exercises for 3 to 5 day shifts. During each test, ICM was measured during three 15-minute periods at the start of the test and at the end of hours 1 and 2. Subjects rated musculoskeletal discomfort per body part using the BPDS at 30, 60, and 120 minutes of each test. The effects of exercises on ICM and BPDS ratings were examined with a two-way repeated-measures analysis of variance with day (2) x time (3) designs. When subjects were doing their exercises ICM was higher at the start and hour 1, and perceived discomfort was lower during each test period (start, hour 1, and hour 2). When not exercising, subjects' musculoskeletal discomfort increased over time and was higher during all test periods. They concluded that exercises done by video display unit operators while at a workstation resulted in short-term decreases in both musculoskeletal discomfort and postural immobility. These results suggest that workstation exercises may be beneficial.

Cook *et al.*, (2000) in their study “The prevalence of neck and upper extremity musculoskeletal symptoms in computer mouse users” investigated whether a relationship existed between computer mouse use and musculoskeletal symptoms. A cross-sectional study was conducted using a sample of 270 computer mouse users. Factors demonstrating significant associations with musculoskeletal symptoms were entered into a step-wise multiple logistic regressions, adjusting for age and sex and controlling for potential interdependence between variables. No relationship was found between hours of mouse use per day and reported symptoms. However a relationship was found between the variable of arm abduction that is specific to mouse use and symptoms in the neck. Also there was a relationship between non-mouse-specific risk factors such as stress, screen height and shoulder elevation and musculoskeletal injury of the neck and upper extremity. The findings of this study support the hypothesis that mouse use may contribute to musculoskeletal injury of the neck and upper extremity. They concluded that mouse users are exposed to the same recognized risk factors associated with keyboard use as well as the additional risk factor of arm abduction during mouse use.

Rosecrance *et al.*, (1998) in their study “Upper Extremity Musculoskeletal Disorders: Occupational Association and a Model for Prevention” investigated evidence associating jobs to various musculoskeletal disorders in the workplace and discussed a model for the prevention of these disorders. They investigated

carpal tunnel syndrome, hand/wrist tendonitis, elbow musculoskeletal disorders, and shoulder/ neck disorders. They concluded that there is a consensus among employers, labor organizations, insurers, and industry associations that occupational musculoskeletal Disorders (MSD) are a major problem leading to adverse health and economic consequences. The duration and frequency of the loads imposed on tissues, as well as adequacy of recovery time, are critical components in whether increased tolerance occurs, or whether reduced capacity occurs which can lead to MSD. Key components of the ergonomics process consist of employees' participation, commitment of the management, the identification of ergonomic hazards, the development of solutions and the evaluation of those solutions. Intervention effectiveness research may provide evidence for effective ergonomic strategies and assure efficient use of limited resources in workplace prevention and intervention programs.

Melhorn and Mark (1996), investigated the relationship of work and other activities to a worker experiencing cumulative trauma disorders (CTD) in the aircraft industry. A group of 212 workers who used rivet guns was placed into a four-way experimental design for ergonomic posture training, exercise training, and rivet-gun type. A statistical model was developed for the level of CTD risk and evaluated using the SAS software program (SAS Institute, Inc., Cary, NC). Statistical analysis demonstrated that only posture training had a beneficial risk reduction for the individual. This study helped to identify the possible benefit of

education and training for controlling CTD and demonstrated the usefulness of being able to evaluate materials, methods, machines, and environments as they relate to the individual's risk level for the development of upper-extremity CTD.

Orta *et al.* (1991) in their study "employee participation in reduction of ergonomic risk factors: attitudes and perception of effects" tested the hypothesis that direct employees' participation in the redesign of their jobs is inversely related to resistance to change as well as to perception of work related discomfort, and increases employees' acceptance of these changes. A quasi-experimental design was set-up in two engine assembly plants. One plant used the participative approach (P). The other plant did not include employee participation (NP). Survey research and participant observation methods were used to assess longitudinally employees' reactions to ergonomics changes to their jobs. The treatment sample sizes were 31 cases at plant P, and 18 at plant NP. Control groups were also set-up at each plant. The outcomes of the study were the following: (1) ergonomic applications are less likely to be openly resisted by workers when they participate in the process of job redesign; (2) objective participation is not directly related to perceptions of significant participation or positive evaluations of the change; and (3) perceived significant participation is related to positive evaluations of the change and reductions in perceived soreness. Nevertheless, performance outcomes show that both plants were effective in the implementation of ergonomic changes regardless of the participative approach, leading to positive

employee reactions and reductions in perceived soreness. They concluded that employees' acceptance of ergonomic changes is critical, and participation increases the likelihood of more acceptable changes compatible with the way employees do their jobs.

2.8 Summary of the Literature Review

The chapter has presented studies done on the application of ergonomics in the management of work-related injuries. Melhorn and Mark, (1996)., Kietrys *et al.*, (2007), Omer *et al.*, (2004), Khan and Siddiqui (2005), Korhonen *et al.*, (2003), and Fenety and Walker, (2002) noted that exercises at the work place are effective in the prevention and management of MSI. Rosecrance *et al.*, (1998), Balci and Aghazadeh, (2004) and Barredo and Mahon (2007), emphasized the importance of micro breaks as a means to prevent discomfort. Omer *et al.*, (2004), Subratty and Koruntollee, (2007), Gerr *et al.*, (2006), Cook *et al.*, (2000), Wahlstrom *et al.*, (2007), Fenety and Walker (2002), Hoogendoorn *et al.*, (2002), and Gerr *et al.*, (2004) discussed work-related risk factors that could lead to the development of work-related musculoskeletal injuries. Juul-Kristensen *et al.*, (2007), Khan and Siddiqui (2005), Subratty and Koruntollee, (2007), and Hagberg *et al.*, (2004), indicated a gender difference in the prevalence of work-related musculoskeletal injuries. Subratty and Koruntollee, (2007), Rosecrance *et al.*, (1998), Gerr, (2006), and Gerr, (2004), emphasized the effect of increased repetition and duration of work on work-related musculoskeletal injuries. Rosecrance *et al.*,

(1998), concluded that occupational musculoskeletal injuries (MSI) are a major problem leading to adverse health and economic consequences. The duration and frequency of the loads imposed on tissues as well as adequacy of recovery time, are critical components in whether increased tolerance occurs, or whether reduced capacity occurs which can lead to MSD. Orta, Arnes, Lid, (1991) emphasized that for all these interventions to be effective the employees must be informed about the risks they may be exposed to and be willing to participate in the interventions. The above studies were conducted outside Kenya and involved non-banking employees. This study investigated the awareness of the existence of work-related risk factors and the efficacy of ergonomic exercises in the control of musculoskeletal injuries and illnesses among bank employees in Kenya.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Introduction

This chapter focuses on the description of the procedures that were used to carry out the study. It presents the research design, location of the study, target population, sample size and sampling procedure, research instruments, data collection procedures, ethical considerations and methods of data analysis and presentation.

3.2 Research Design

This study adopted a survey research design. Survey research involves the collection of data or information from a sample of a population so as to establish the current status of the entire population on one or a number of samples (Mugenda and Mugenda, 1999; Kombo and Tromp, 2006). This design therefore, allowed the researcher to collect data from selected bank employees and establish the status of the entire bank employees' population.

3.3 Location of the Study

The study was carried out in Nairobi Province. Nairobi province was selected because it has large number of banks in the country.

3.4 Target Population

The target population for this study comprised of bank employees in the local banks, that is, Kenya Commercial Bank, National Bank, Co-operative Bank, Equity Bank and the Family Finance Banks in the city center. The respondents included the clerks, tellers, secretaries and officers. These banks were selected since they have the largest number of branches in Nairobi. There were 8 Kenya commercial banks, 6 National Banks, 9 Co-operative Banks, 5 Family Finance and 5 Equity Banks Branches in Nairobi constituting 1,500 bank employees in total.

3.5 Sample Size and Sampling Procedures

Stratified random sampling procedure was used. This was to ensure that every group of subjects was accorded equal opportunity of being represented in the study. The process of stratification was based on the five banking institutions, that is, Kenya Commercial Bank, National Bank, Co-operative Bank, Equity Bank and the Family Finance Bank. 17 (50%) of the branches in these banks, that is, 4 Kenya Commercial Banks, 3 National Bank, 4 Co-operative Banks, 3 Equity Banks and 3 Family Finance Banks were selected. Finally, a proportion of 30% of the employees from each branch was randomly selected. This added up to a total of 450 subjects representing 30% of the population. These proportions were more than the 20% proportion recommended for a survey research by Bartlett *et al.* (2001), and were therefore adequate for this study.

3.6 Research Instruments

The researcher collected data by use of close-ended questionnaire items (Appendix C). Questionnaires are commonly used to collect necessary information from the population (Kombo and Tromp, 2006; Mugenda and Mugenda, 1999; Payne and Payne, 2004). The questionnaire used was a modified version of Nishanth Reddy's Ergonomics questionnaire, which has been used in previous similar studies (Reddy, 2006).

3.7 Pilot Study

A pilot study was carried out at Post Bank Kenyatta avenue branch and Commercial Bank of Africa Upper hill branch. This is identical to those that were used in the main study and was not utilized in the main study. The aims of the pilot were:

- i. Checking the instrument's reliability. The split-half technique was used for this purpose. The questionnaire items were numbered and the odd and even numbers formed the two halves. A statistically acceptable correlation of 0.78 was found between the two halves and it was therefore concluded that the test would produce similar results with repeated administration.
- iii. To check for the validity of the instruments. The supervisors examined the research instruments and adjusted them accordingly to ensure that

the questions were able to gather information relating to the variables accurately.

- iv. To acquaint the researcher with skills necessary for effective administration of the questionnaires.
- v. To check the administrability of the instruments among the bank employees in Kenya.

3.8 Data Collection Procedure

The process of data collection included:

- i. Presentation of copies of the research permit and authorization letter to the Resource Managers of the targeted banks
- ii. Distribution of the questionnaires to the bank employees
- iii. Collection of the completed questionnaires on dates agreed upon and follow-up on delayed responses.

3.9 Ethical Considerations

The researcher obtained a research permit from the Ministry of Education and an introductory letter from the university to assist in the request for permission to carryout the research from the banks. In addition, the employees were requested to sign the consent form (Appendix C) prior to participation in the study. The respondents were assured of confidentiality and that the data collected would only be used for the purpose of the study.

3.10 Data Analysis and Presentation

The data obtained were subjected to statistical analysis using the Statistical Package for Social Scientists (SPSS-version 11.5) computer program. Chi-square at 0.05 level of confidence was used to test the hypothesis. Chi-square test is a statistical test used to examine differences between categorical variables. There are a number of features of the social world we characterize through categorical variables. Data collected for this study were categorized into three variables; Yes, No, No idea and thus the use of Chi-square for analysis (Vincent, 1995). To determine whether the calculated differences among the various groups of employees were in agreement the Kendall's W Test was run. Kendall's W Test is used to normalize the Friedman's Chi-square test and indicate the agreement among raters or subjects under investigation. The results were reported in frequency counts and percentages and then presented in tables, graphs and figures.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings, interpretations and discussions of the results. Out of the 450 sampled employees 321 responded and returned their questionnaires. Therefore, responses obtained from only 321 (71%) of the questionnaires were used for the data analysis.

4.2 Research Hypothesis

The hypotheses for the study were:

Ho₁ There would be no significant difference amongst the male and female bank employees in terms of their awareness of work-related risk factors.

Ho₂ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their awareness of work-related risk factors.

Ho₃ There would be no significant difference amongst the male and female bank employees in terms of their awareness of the efficacy of ergonomic exercises in reducing the occurrence of MSI.

Ho₄ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their awareness of the efficacy of ergonomic exercises in reducing the occurrence of MSI.

Ho₅ There would be no significant difference amongst the male and female bank employees in terms of their engagement in ergonomic exercises during the official working hours.

Ho₆ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises.

Ho₇ There would be no significant difference amongst the male and female bank employees in terms of prevalence of work-related musculoskeletal injuries

Ho₈ There would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses.

4.3 Presentation of the Findings and Discussions

Figure 4.1 shows the distribution of employees in the banking institutions in relation to gender.

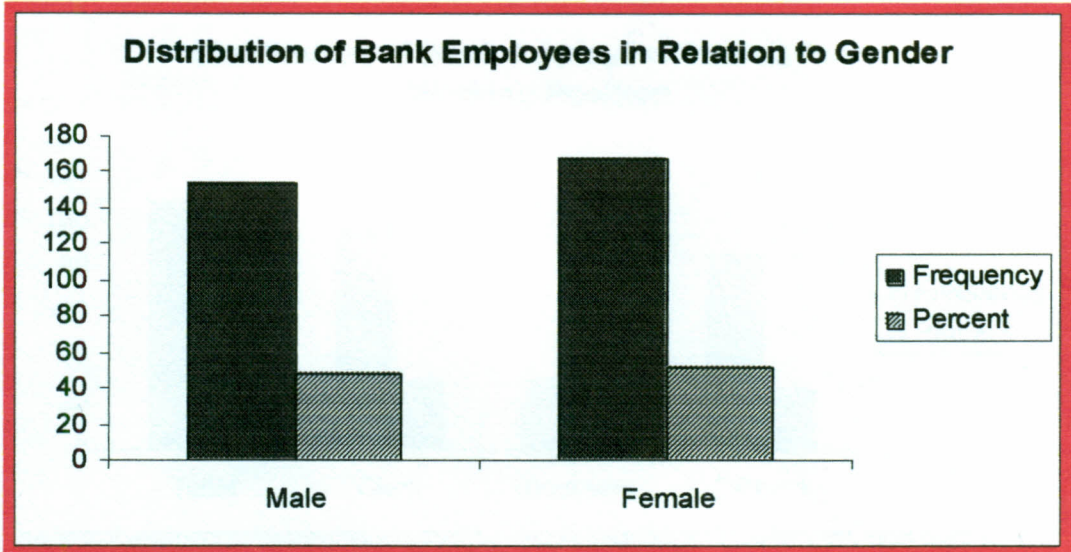


Figure 4.1: Characteristic Distribution of the Bank Employees in Relation to Gender

Out of the 321 bank employees a majority (164; 52%) were female. This shows that males were slightly less than the female. This could be because of the fact the banks tended to engage more female employees in computer related work than the males. This kind of distribution was also observed in a study conducted by Hagberg *et al.*, (2004), on computer users from various occupations.

In addition to the distribution of the bank employees in terms of gender they were also classified in terms of their position at the bank. This distribution is presented in Figure 4.2.

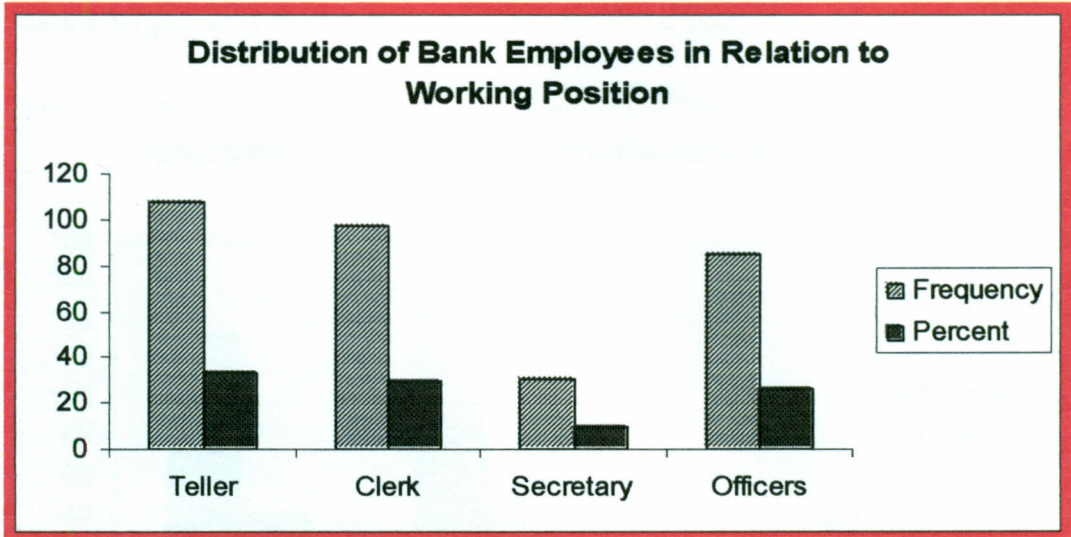


Figure 4.2: Characteristic Distribution of the Bank Employees in Relation to Position of Work at the Bank

Figure 4.2 shows that the tellers were the majority (108; 33.6%) followed by the clerks (97; 30.2%), officers (85; 26.5%) and the list were the secretaries (31; 9.7%). This shows that there were more tellers than any other group of employees. This could be attributed to the fact that the tellers are in direct contact with a large number of bank clients over the counters thus necessitating the large number of tellers in order to facilitate their service delivery. The clerks were second in number because they serve fewer clients seeking directions clarification of issues among other customer care services. The officers are persons directing the banks and take care of complicated or sensitive issues in the banks, hence few in number. The secretaries only serve the officers in charge of the banks and their branches; thus making them fewest in number.

Figure 4.3 presents employees' responses on the work-related risk factors.

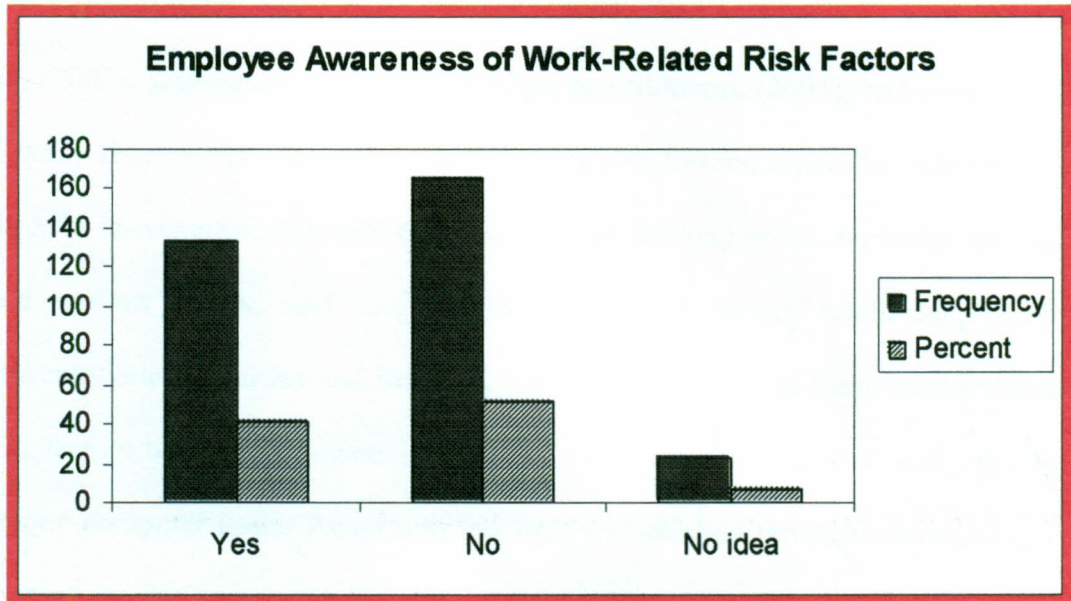


Figure 4.3: Employees' Responses on Work-Related Risk Factors in the Banking Institutions.

Figure 4.3 shows that out of the 321 respondents, a large number (165; 51.40%) was not aware of the work-related risk factors, 133 (41%) were aware of the work-related risk factors while 23 (7.17%) had no idea. This lack of awareness among the bank employees could be attributed to the training which probably did not emphasize this aspect of their safety. Also it could mean that the bank management may not be involved in advising their employees on their possible vulnerability to the work-related musculoskeletal injuries and illnesses.

These results seem to tally with those of studies by Rosecrance et al., (1998), Cook *et al.*, (2000), Juul-Kristensen *et al.*, (2004), Gerr et al., (2004), Korhonen et al., (2003), Wahlstrom *et al.*, (2007), Khan and Siddiqui, (2005), and Gerr *et al.*, (2006). These studies identified the following risk factors; repetitive movements, forceful movements, awkward posture, working for long hours, muscular tension and contact stress, and showed that they had direct relationship with musculoskeletal injuries and illnesses. Lack of awareness of these work-related risk factors has been associated with the occurrence of musculoskeletal injuries among computer users. Awareness can only be achieved through education and training as recommended by Orta *et al.*, (1991) who noted that ergonomic adjustments are better accepted and implemented by employees when they are aware of the procedure and the benefits of participation. These views are also held by Melhorn (1996), Rosecrance et al., (1998), Omer *et al.*, (2004), and Subratty and Korumtollee, (2007).

Though these studies were neither conducted in banking institutions and among bank employees nor within a Kenyan setup, they were carried out among computer users who perform tasks similar to those done by bank employees in Kenya. It would therefore imply that bank employees in Kenya could be at risk of developing work-related musculoskeletal injuries and illnesses, as it is the case with computer users in other countries.

The awareness of work-related risk factors was further investigated to identify possible gender differences. The results are presented in table 4.1.

Table 4.1: Bank Employees' Responses on their Awareness of Work-Related Risk Factors in Relation to Gender.

Responses	Gender		
	Male	Female	Total
Yes	67 (43.61%)	66 (39.5%)	133 (41.43%)
No	76 (49.4%)	89 (53.57%)	165 (51.4%)
No idea	11 (6.99%)	12 (6.93%)	23 (7.17%)
Total	154 (100.0%)	167 (100.0%)	321 (100%)

$X^2=74.83$, $n=321$, $df=1$, $p=0.01$, critical value= 3.84 at 0.05 (Significant)

Table 4.1 shows the results presented earlier indicating that most of the employees (165; 51.4%) were unaware of the work-related risk factors. In addition, it indicates that a majority of the females (89; 53.57%) were unaware of the work-related risk factors. A total of 76 (49.4%) of the males were also ignorant of the risks. On the other hand, smaller proportions of the females (66; 39.5%) and the males (67; 43.61%) were aware of the factors. To determine if this gender difference was significant a Chi-square test was run. It is evident that there was a significant difference in the responses on the awareness of work-related risk factors in terms of gender. This is because the calculated X^2 (74.83, $p=0.01$) was greater than the critical value ($X^2=3.84$) at 0.05 confidence level. As a result, the null hypothesis (H_{01}) that there would be no significant difference amongst the

male and female bank employees in terms of their awareness of work-related risk factors was rejected.

This means that either the women have less access to information relating to the work-related risk factors or they are preoccupied with other issues that may deny them time to seek for the information. Lack of awareness of work-related risk factors among the female bank employees could have led to the occurrence of musculoskeletal injuries. This could be one of the reasons why Juul-Kristensen *et al.*, (2004), Hagberg *et al.*, (2004), Subratty and Korumtollee (2007), and Korhonen *et al.*, (2003) indicated higher injury prevalence among female computer users than their male counter parts.

A further investigation on the issue of work-related risk factors was conducted among the employees in relation to their working positions in the banks. The results were as presented in table 4.2.

Table 4.2: The Employees' Awareness of Work-Related Risk Factors in Relation to their Positions at Work

Employees Position	Responses			
	Yes	No	No Idea	Total
Tellers	35 (32.41%)	64 (59.26%)	9 (8.33%)	108 (100%)
Clerks	37 (38.14%)	54 (55.67%)	6 (6.19%)	97 (100%)
Secretaries	12 (38.71%)	15 (48.39%)	4 (12.90%)	31 (100%)
Officers	49 (57.65%)	32 (37.65%)	4 (4.71%)	85 (100%)
Total	133 (41.43%)	165 (51.40%)	23 (7.17%)	321 (100 %)

X^2 36.98, n=321, df=1, p=0.05 critical X^2 =3.84 (significant) Kendall's Coefficient of Concordance= 0 .32

According to table 4.2, majority of the tellers (64; 59.26%) indicated that they were unaware of the work-related risk factors. Second in majority (54; 55.67%) were the clerks followed by the secretaries and the officers (15; 48.39%) and (32; 37.65%) respectively. However, a large proportion of the officers (49; 57.65%) indicated a higher level of awareness followed by the secretaries at 12; 38.71%), clerks at (37; 38.14%) while the least aware were the tellers at (35; 32.41%). Only small proportions of the employees: tellers (9; 8.33%), secretaries (4; 12.90%), clerks (6; 6.19%), and the officers (4; 4.71%) had no idea about the work-related risk factors. It is therefore evident that the tellers were the most unaware of the

work-related risk factors followed by the clerks, the secretaries and the officers in that order.

To test whether these differences were significant a Chi-square test was conducted. The results were as shown in table 4.2 that indicated that there was a significant difference in the responses on the awareness of work-related risk factors among the bank employees. This is because the calculated X^2 value (36.98, $p= 0.05$) was greater than the critical value ($X^2 =3.84$, $p=0.05$). In addition, Kendall's W Test was run to determine the agreement between the raters of the differences between different cadres of employees. In this case a Kendall's Coefficient of 0.32 was obtained. This means that there was an agreement between the differences observed on different group of employees. Due to this reasons the null hypothesis (H_0) that there would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their awareness of work-related risk factors was rejected.

The tellers and the clerks were the least informed followed by the secretaries and the officers. This could be attributed to the nature of work done by these groups of bank employees. Tellers and the clerks in most cases work in stations that are sometimes compromised in terms of space and the employees have little or no control of the way the arrangement of equipment is done. These employees' perform a lot of data entry tasks than cognitive tasks. These tasks are very often

performed under pressure from long queues of impatient clients leaving the employees no time to perform even spontaneous adjustments. Their training could also be a contributing factor if it does not sensitize them on their safety at the work place and on ways to improve their performance. In addition, it would also imply lack of time among the tellers and the clerks to look for the necessary information.

On the other hand, the secretaries and the officers often work in places that are more spacious compared to those of the tellers and the clerks. This would mean that they could be able to adjust it to a more comfortable setting. The secretaries and the officers also often perform more of cognitive tasks than data entry that would translate to availability of time to relax and stretch some muscles. The nature of their work may as well provide them with periods of reduced work or even more frequent rest breaks. Another interpretation of this scenario is that since the secretaries and the officers do not serve their customers under pressure, they are able to find time to gather some information on the work-related risk factors. These results seem to concur with the study by Rosecrance *et al.*, (1998) which indicated time spent on the computer as one of the work-related risk factors. In this case the tellers and the clerks are more exposed because they spent the longest hours on the computer as compared to the secretaries and the officers. They also seem to concur with studies conducted by Balci and Aghazadeh,

(2004), and Korhonen *et al.*, (2003), which indicated an increase in risk factors depending on the kind of task performed by the employees.

Table 4.3 presents the bank employees' views on the applicability of ergonomic exercises in the banking institutions during the official working hours. It also shows the distribution of the responses in relation to gender.

Table 4.3: Responses of Bank Employees' Possibility of Stretching in the Banking Institutions during the Official Working Hours

Responses	Gender		
	Male	Female	Total
Yes	55 (35.71%)	69 (41.32%)	124 (38.63%)
No	80(51.95%)	74 (44.31%)	154 (47.98%)
No idea	19 (12.34%)	24 (14.37%)	43 (13.40%)
Total	154 (100.0%)	167 (100.0%)	321 (100%)

$X^2=54.02$, $n=321$, $df=1$, $p=0.01$, Critical $X^2=3.84$ at $p=0.05$ (Significant)

Table 4.3 shows that out of the 321 respondents, a considerably large proportion (154; 47.98%) were of the view that it would not be possible to engage in ergonomic exercises at the workplaces and during the official working hours. A smaller proportion (124; 38.63%) however held the view that it would be possible while a proportion of (43; 13.40%) had no idea whether it would be possible. It is therefore evident that most of the employees held the view that it would not be

possible to engage in ergonomic exercises. The table also presents a gender difference on the issue. A large percentage of the males (80; 51.95%) were not aware of the applicability of ergonomic exercises during official working hours. In comparison, only 74 (44.31%) of the females were unaware. Smaller percentages of the males (55; 35.71%) and females (69; 41.32%) were aware of the applicability of ergonomic exercises. Only 24 (14.37%) females and 19 (12.34%) males had no idea on this issue. It is therefore evident that the males were most unaware of the applicability of ergonomic exercises during official working hours.

This observation could be attributed to lack of time to engage in exercises as a result of the tight and busy schedules at the banking institutions. It could also imply that the bank employees are not aware of exercises they could engage in during their official working hours. In addition, it is likely that the training they undergo during recruitment does not address the issue of ergonomic exercises. The gender differences in the results also indicate that the females had little time to spare for the exercises and thus did not think it would be possible to exercise. According to the outcome of the Chi-square test to establish whether there was a significant difference in the responses, the null hypothesis (H_{05}) that there would be no significant difference amongst the male and female bank employees in terms of their engagement in ergonomic exercises during the official working

hours was not upheld. This is because the calculated Chi-square value ($X^2=54.02$, $p=0.01$,) was greater than the Critical value ($X^2=3.84$, $p=0.05$).

Contrary to this thought, studies have indicated that individuals throughout the day can easily schedule short periods of office exercises. Some activities can be easily performed by individuals at their desk and only could take a little time even as little as a minute or two. 30 to 60 second micro-breaks with few stretches can be taken every 30 minutes (Fenety and Walker, 2002). The one to two-minute exercise breaks incorporating movement and stretching help prevent the symptoms of work-related musculoskeletal injuries and therefore help maintain the body's health (Fenety and Walker, 2002). Balci and Aghazadeh, (2004), developed three exercise rest periods and tested their efficiency in the reduction of work-related injuries among employees. These schedules included 60 minutes work/10 min rest, 30 min work/ 5 min rest and four rests in an hour in addition to 14 min rest at the end of two hours. Another study that showed the applicability of ergonomic exercises is one by Kietrys *et al.*, (2007) which incorporated computer users in an investigation that required them to participate in at-work exercises for a period of four weeks. The idea was also supported by Omer *et al.*, (2004) and Barredo and Mahon, (2007).

The bank employees' views on the applicability of ergonomic exercises were further checked in terms of employees' working position. The results are presented in table 4.4.

Table 4.4: Responses of Bank Employees' Possibility of Stretching in the Banking Institutions during the Official Working Hours in Relation to their Working Positions

Employees Position	Responses			
	Yes	No	No Idea	Total
Tellers	31 (28.7%)	56 (51.9%)	21 (19.4%)	108 (100%)
Clerks	30 (30.93%)	48 (49.5%)	19 (19.6%)	97 (100%)
Secretaries	21 (67.74%)	10 (32.3%)	0 (0%)	31 (100%)
Officers	42 (49.41%)	40 (47.1%)	3 (3.5%)	85 (100%)
Total	124 (38.63%)	154 (47.98%)	43 (13.40%)	321 (100 %)

$X^2 = 16.90$ $n=321$, $df=1$, $p=0.19$, Critical $X^2 = 3.84$ at $p=0.05$ (Significant),
Kendall's Coefficient of Concordance=0.52

According to table 4.4, it is clear that a larger proportion of the tellers (56; 51.9%) were not aware of the applicability of ergonomic exercises in the banking institutions during official working hours. They were followed by the clerks (48; 49.5%), the officers (40; 47.98%) and the secretaries were trailing. It is therefore evident that tellers were the most unaware followed by the clerks, the officers and the secretaries in that order. To determine whether these differences were

significant, a chi-square test was run and the results are shown in table 4.4 above. It indicates that the differences in the responses on the applicability of ergonomic exercises are significant. This is because the calculated χ^2 value ($\chi^2=16.90$, $p=0.19$) was greater than the critical χ^2 (3.84, $p=0.05$). In addition, Kendall's W Test was run to determine the agreement between the raters of the differences between the tellers, clerks, secretaries and officers. In this case a Kendall's Coefficient of 0.52 was obtained. This means that there was an agreement between the differences observed on different group of employees. The null hypothesis (H_{06}) that there would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises was therefore rejected.

This observation may be attributed to the nature of work done by these employees. Since the tellers and the clerks are almost in constant contact with the clients they could not find time for the exercises and therefore reported they would not be applicable to them. On the other hand the secretaries and the officers are often not in contact with the clients and therefore manage to engage themselves in the exercises during the official working hours.

The responses on the bank employees' views on the effects of ergonomic exercises on the occurrence of musculoskeletal injuries are presented in table 4.5.

Table 4.5: Responses on the Employees' View on the Efficacy of Ergonomic Exercises in Reducing the Occurrence of Work-Related Musculoskeletal Injuries in Relation to Gender.

Responses	Gender		
	Male	Female	Total
Yes	63 (40.91 %)	61(36.51%)	124 (38.63%)
No	30(19.48%)	39 (23.4%)	69 (21.50%)
No idea	61 (39.61%)	67(40.11%)	128 (39.88%)
Total	154 (100.0%)	167 (100.0%)	321 (100%)

X^2 15.76, n=321, df=1, p=0.01, Critical X^2 =3.84 at p=0.05 (Significant)

Based on the bank employees' frequency of responses, a higher proportion of them i.e. 128 (39.88%) indicated that they had no idea of the effect of engaging in ergonomic exercises during the official working hours would have on musculoskeletal injuries. A smaller proportion of the employees 124 (38.63%) indicated that the ergonomic exercises would help alleviate the effects of musculoskeletal injuries and illnesses while the least proportion 69 (21.50%) indicated that ergonomic exercises would have no effect on musculoskeletal injuries and illnesses. It is therefore clear that most of the bank employees were not aware of the efficacy of engagement in ergonomic exercises in the reduction of the effects of musculoskeletal injuries and illnesses. It is also evident from the table that there was a slight gender difference in the responses on whether engaging in ergonomic exercises would help reduce the effects of musculoskeletal injuries and illnesses. A larger proportion of the female 67 (40.11%) had no idea

on this issue compared to a frequency of 61 (39.61%) among the male. A proportion of 63 (40.91%) males and 61 (36.51%) female were for this idea. Smaller proportions of the male and female i.e. 30(19.48%) and 39 (23.40%) respectively reported that stretching during official working hours would not have an effect on the musculoskeletal injuries. The male bank employees were more aware than the female bank employees. To investigate if the observed differences were significant a Chi-square test was computed. The calculated Chi-square value ($X^2=15.76$, $p=0.01$) was greater than the critical value ($X^2=3.84$, $p=0.05$). As a result the null hypothesis (H_{03}) that there would be no significant difference between the male and female bank employees in terms of their views on the efficacy of ergonomic exercises in reducing the occurrence of work-related musculoskeletal injuries and illnesses was rejected.

This observation could imply that the bank employees, more so the female, do not know the effects of exercise on the muscular and skeletal systems. Therefore, they would not be able to relate exercise and their work and thus the perception that ergonomic exercises cannot prevent work-related injuries and illnesses. Contrary to the view that ergonomic exercises can not prevent, control or even reduce the occurrence and the severity of work-related musculoskeletal injuries, Balci and Aghazadeh, (2004), point out that rest breaks which can be combined with stretching can reduce various perceived discomfort categories and therefore influence the performance of the employees. Also Kietrys *et al.*, (2007) assessed

adherence, pain and satisfaction after 4 weeks of at-work exercise and concluded that most subjects found the resistance and the stretching exercises easy to engage in; they performed them 1 to 2 times in a day, and noted a reduction in discomfort. Omer *et al.*, (2004) as well noted that mobilization, stretching, strengthening and relaxation exercises reduced pain and depression levels of CTD patients in the short term. According Fenety and Walker (2002), when subjects engaged in exercises, perceived discomfort were lower than when not exercising. Lastly, Barredo and Mahon (2007) reviewed the strength of research evidence on the effects of exercise and rest breaks on musculoskeletal discomfort during computer tasks and compared the evidence with clinical guidelines. They noted that evidence supported the use of exercise and rest breaks in reducing musculoskeletal discomfort in computer tasks.

The employees' response on the effect of ergonomic exercises was further investigated in relation to the position occupied by the employees at the banking institutions. The results are presented in table 4.6.

Table 4.6: Responses on the Employees' Views on the Efficacy of Ergonomic Exercises in Reducing the Occurrence of Work-Related Musculoskeletal Injuries in Relation to Working Position.

Employees Position	Responses			
	Yes	No	No Idea	Total
Tellers	31 (28.7%)	25 (23.1%)	52 (48.1%)	108 (100%)
Clerks	32 (33.0%)	22 (22.7%)	43 (44.3%)	97 (100%)
Secretaries	12 (39.4%)	6 (19.4%)	13 (41.2%)	31 (100%)
Officers	49 (58.1%)	16 (18.8%)	20 (23.1%)	85 (100%)
Total	124 (38.63%)	69 (21.50%)	128 (39.88%)	321 (100 %)

X^2 16.43, n=321, df=1, p=0.01, Critical X^2 =3.84 at p=0.05 (Significant)
Kendall's Coefficient of Concordance= 0.51

According to table 4.6 it is evident that the larger proportion of the tellers (52; 48.1%) had no idea about the efficacy of ergonomic exercises in the reduction of work-related injuries and illnesses compared to 31 (28.70%) who reported that ergonomic exercises can alleviate the effect of musculoskeletal injuries and 25 (23.1%) who thought the exercises would have no effect. The tellers were followed by the clerks 43 (44.3%), secretaries 13 (41.2%) and the officers 20 (23.1%) in lack of awareness. To investigate if the observed differences were significant a Chi-square test was run. The calculated Chi-square value (16.43, p=0.01) was greater than the critical value (3.84, p=0.05). In addition, Kendall's W Test was run to determine whether the differences between the different groups

of bank employees were in agreement. A Kendall's Coefficient of 0 .35 was obtained meaning that there was an agreement between the differences observed on different group of employees. As a result the null hypothesis (H_{04}) that there would be no significant difference among the tellers, clerks, secretaries and officers in terms of their views on the efficacy of ergonomic exercises in reducing the occurrence of work-related musculoskeletal injuries and illnesses was rejected.

This could be attributed to the employees' perception of availability of free time to engage in the exercises. The tellers and the clerks would perceive impossibility in finding time to exercise due to their constant contact with the clients. On the other hand the secretaries and the officers would perceive a possibility in finding time for exercise since they enjoy some periods without contact with their clients, thus allowing time for exercise.

Information was also sought about the times that the employees engaged in ergonomic exercises. The responses are presented in Figure 4.4.

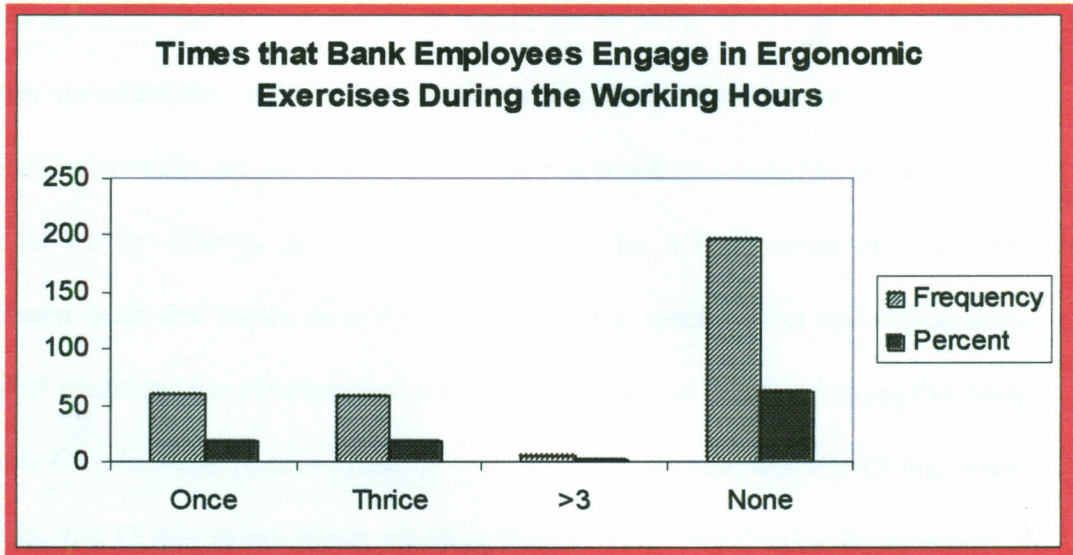


Figure 4.4: Responses on the Number of Times that the employees engaged in Ergonomic Exercises during the Official Working Hours

Figure 4.4: shows that a majority (197; 61.37%) of the bank employees did not engage in the exercises at all. Smaller proportions however indicated participation. A proportion of 61 (19%) of the employees reported that they exercised only once in a day, these were followed by those who exercised three times i.e. 58 (18.07%) while the least proportion (5 ;1.56%) engaged in the exercises more than thrice. It is therefore evident that most of the employees do not engage in ergonomic exercises while carrying out their daily office tasks. This could be attributed to the fact that the employees are not aware of the applicability of such exercises during the official working hours.

Contrary to the belief of many that it would not be possible to engage in exercises while operating the computers at work places, studies have demonstrated that it would be possible and suggested the number of times this could be done. A study conducted by Kietrys *et al.*, (2007) showed the effectiveness of exercising between once and twice in a day throughout the week. Balci and Aghazadeh, (2004) evaluated the efficiency of different exercise rest breaks. Among the three, that is 60 min work/10 min break, 30 min work/ 5 min rest, and the 15 min micro breaks, the 15 min micro break schedule proved the most effective in reduction of the occurrence of MSI among the computer users. These studies have demonstrated that exercising more than once in a day can reduce the occurrence of the MSI.

Bank employees' responses on the occurrence of work-related musculoskeletal injuries were sought and the responses are presented in Figure 4.5.

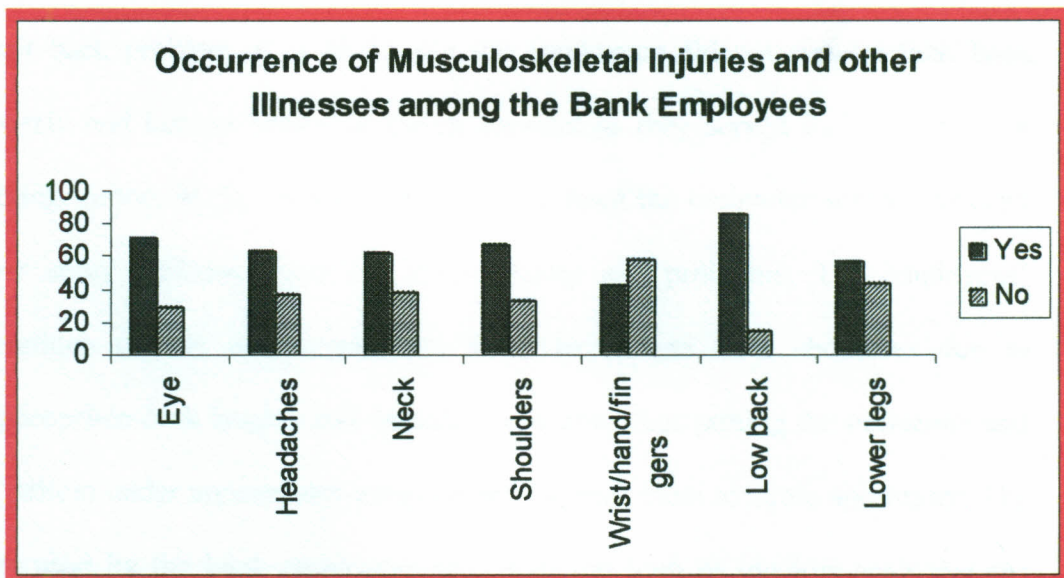


Figure 4.5: Responses on the Occurrence of Work-Related Musculoskeletal Injuries among the Bank Employees

Figure 4.5 shows that majority (205; 63.86%) of the employees were suffering from musculoskeletal injuries at their places of work. It also shows that a large number of employees experienced lower back problems (276; 86%). This condition was followed by computer vision syndrome (229; 71.3%), shoulder pains (214; 66.7%), headaches (204; 63.6%), neck pains (197; 61.4%), lower legs (180; 56.1%) and a smaller group (136; 42.4%) suffered from carpal tunnel syndrome. The fact that a large proportion of the bank employees suffer from musculoskeletal injuries could be attributed to the lack of awareness of the work-related risk factors and ergonomic exercises among the bank employees. These results could also be interpreted to indicate that the employees are insensitive to their sitting posture and this could be the reason why most of them suffer from

lower back problem. It is likely that the employees did not support their back properly and instead tended to hunch forward as they served their clients. The lighting system in the banking offices, glare from the computer screens or from other shiny surfaces affect the eyes causing eye problems. The employees' operations on the computers force them to elevate their shoulders due to inappropriate desk heights and or lack of arm rests thus putting the trapezium and the deltoid under unnecessary pressure and exposes them to strain and injury. The seats used by the bank employees are either too high or too low such that the employees are not able to rest their feet comfortably parallel to the floor to ease tension on the muscles of the lower legs thus exposing them to injury.

These results concur with other studies that have indicated the occurrence of musculoskeletal injuries at work places. These studies include: Rosecrance *et al.*, (1998) who investigated carpal tunnel syndrome, hand/wrist tendonitis, elbow musculoskeletal disorders, and shoulder/ neck disorders; Omer *et al.*, (2004) whose subjects complained of head, neck, shoulder, back and wrist pains; Subratty and Korumtollee, (2007) whose findings showed conditions such as eye problems, lower back problem, neck and shoulder pain were common among computer users, as well as Khan and Siddiqui, (2005) who reported the prevalence of low back pain among computer users. The results showed that Low back pain was a common condition in computer users. Another study by Hoogendoorn *et al.*, (2002) showed similar results. Juul-Kristensen *et al.*, (2004) conducted a

study to determine factors of computer work that predict musculoskeletal symptoms in the shoulder, elbow, and low-back regions. They noted that rest pauses, disturbance by glare or reflection, and screen height were potential risk factors.

These results also imply that because of the bank employees' lack of awareness they could not identify the risks, develop solutions and implement them and then evaluate the effectiveness of the solutions (Rosecrance *et al.*, 1998). It would also indicate that the occurrence of musculoskeletal injuries could be prevented and controlled through providing the employees with the necessary education and training on various work-related risk factors. Melhorn and Mark (1996) helped to identify the possible advantages of education and training in controlling musculoskeletal injuries and demonstrated the benefits of being able to evaluate materials, methods, machines, and environments as they relate to the individuals' risk level. In addition to training, the employees should be provided with an ergonomically conducive working environment (Subratty and Korumtollee, 2007). The provision of an ergonomically sound working environment is the duty of both the employees and the employers. Employees' acceptance of the ergonomic changes is critical and their participation in the formulation of such changes increases the likelihood of their acceptance of the changes compatible with their duties (Balci and Aghazadeh, 2004; Rosecrance *et al.*, 1998).

The study also checked whether there was any difference amongst men and women in terms of the occurrence of musculoskeletal injuries. Their responses were as presented in table 4.7.

Table 4.7: Responses on the Occurrence of Work-Related Musculoskeletal Injuries among the Bank Employees in Relation to Gender

Responses	Gender (%)		
	Male	Female	Total
Yes	99 (64.20%)	106 (63.67%)	205 (63.86%)
No	55 (35.79%)	61 (36.33%)	116 (36.14%)
Total	154 (100)	167 (100)	321 (100%)

$X^2=3.50$, $n=321$, $df=1$, $p=0.01$, Critical $X^2=3.84$ at $p=0.05$ (Not significant)

According to the frequency counts as presented in the table 4.7, a larger percentage (106; 63.67%) of the female bank employees suffered from musculoskeletal injuries as compared to a small percentage (61; 36.33%) that indicated freedom from such injuries. In the same way an equally large percentage (99; 64.20%) of the males also suffered from the musculoskeletal injuries compared to a proportion of 55 (35.79%) that indicated otherwise. Results of the Chi-square analysis show no significant gender difference in the responses on the occurrence of MSI between male and female bank employees. Therefore, the null hypothesis (H_{07}) that there would be no significant difference amongst the male and female bank employees in terms of prevalence of work-related musculoskeletal injuries was upheld.

The expectation that the female bank employees would suffer from musculoskeletal injuries more than the male bank employees because they lacked awareness of the work-related risk factors was disputed. These results show that apart from the employees' awareness of the work-related risk factors other aspects could also influence the occurrence of the musculoskeletal injuries. Though Juul-Kristensen *et al.* (2004), Hagberg *et al.*, (2004), Subratty and Korumtollee (2007), and Korhonen *et al.*, (2003) indicated a relationship between work-related risk factors and occurrence of musculoskeletal injuries, results of this study indicate that awareness of the work-related risk factors could not be the single most important factor for the occurrence of these injuries. Studies by Kietrys *et al.*, (2007) and Hoogendoorn *et al.*, (2002) show other work-related factors such as low job satisfaction, mental and psychological stress, as well as involvement in physical exercises which could as well lead to the development of musculoskeletal injuries and illnesses.

Ergonomic exercises can help to alleviate the effects of musculoskeletal injuries. This is because though female employees were less aware of the work-related risk factors as compared to the male, they suffered from the MSI just as much as the male employees who were more aware of the work-related risk factors. This indicates that the higher engagement in ergonomic exercises by the female employees assisted them to overcome some of the challenges posed by MSI. These observations suggest that employees' engagement in ergonomic exercises

could be more effective in the prevention and reduction of the occurrence of musculoskeletal injuries more than creation of awareness of the work-related risk factors among them. These results conquer with those of studies by Balci and Aghazadeh (2004), Rosecrance *et al.*, (1998), Kietrys *et al.*, (2007), Omer *et al.*, (2004), Gerr *et al.*, (2007), Fenety and Walker, (2002), and Barredo and Mahon, (2007) that emphasized the importance and the effectiveness of ergonomic exercises in the reduction, control, and prevention of musculoskeletal injuries among computer users who include the bank employees.

The results of this study show that the male and the female bank employees are exposed to the risk of developing musculoskeletal injuries indiscriminately. However, results as this do not concur with those of the study by Khan and Siddiqui (2005) that suggested that male computer users are more prone to work-related musculoskeletal injuries than their female counterparts. It also does not tally with the results of studies by Juul-Kristensen *et al.*, (2004), Hagberg *et al.*, (2004), Subratty and Korumtollee (2007), and Korhonen *et al.*, (2003) who indicated a higher rate of injury prevalence among the female computer users than male computer users. These contradictory findings between the results could be attributed to the varying responses on the awareness of work-related risk factors and the application of ergonomic exercises in the banking institutions among the male and female bank employees. This could imply that the male and female bank

employees had different understanding of problems at hand (were heterogeneous) hence the non-concurrence between the results.

The study also sought to establish whether there was any difference amongst the tellers, clerks, secretaries and the officers in terms of the occurrence of musculoskeletal injuries. Their responses are presented in table 4.8.

Table 4.8: Presentation of Responses on the Occurrence of Work-Related Musculoskeletal Injuries among the Bank Employees in relation to position of work

Employees Position	Responses		
	Yes	No	Total
Tellers	85 (78.70%)	23 (21.30%)	108 (100%)
Clerks	67 (69.17%)	30 (30.83%)	97 (100%)
Secretaries	16 (52.95%)	15 (47.05%)	31 (100%)
Officers	37 (43.78%)	48 (56.22%)	85 (100%)
Total	205 (63.86%)	116 (36.14%)	321 (100 %)

$X^2=124$, $n=321$, $df=1$, $p=0.01$, Critical $X^2=3.84$ at $p=0.05$ (Significant), Kendall's Coefficient of Concordance=0.4

In table 4.8 a majority of the tellers (85; 78.70%) suffered from the musculoskeletal injuries followed by the clerks (67; 69.17%), secretaries (16; 52.95%), the officers (37; 43.78%). Only small proportions of the employees did not suffer from the MSI except the officers who had the largest number (48;

56.22%) of those that did not suffer from the injuries. In terms of proportions the secretaries (15; 47.05%) followed, then the clerks (30; 30.83%) and lastly the tellers (23; 21.30%). It is evident that tellers and the clerks were the most affected while the officers and secretaries were least affected. To test whether the differences observed were significant, a Chi-square test was computed. The outcome of the Chi-square test showed that there was a significant difference in the responses on the occurrence of work-related musculoskeletal injuries among the bank employees in terms of their working position. This is because the calculated value of Chi-square (124, $p=0.01$) was greater than the critical Chi-square value (3.84, $p=0.05$). In addition, a Kendall's Coefficient of 0.39 was obtained meaning that there was an agreement between the differences observed on different group of employees. As a result, the null hypothesis (H_{08}) that there would be no significant difference amongst the clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses was rejected.

The prevalence of MSI amongst majority of various cadres of the bank employees can be attributed to their lack of awareness of the work-related risk factors as well as the set up of their workplace as indicated earlier on page 74. On the other hand the officers and the fact that the secretaries suffered less injury than the tellers and clerks may be due to the nature of their work set up that is almost ergonomically sound. They have more room and free time because their tasks are not highly

repetitive or highly frequent (Rosecrance *et al.*, 1998). This set up may allow them to often change posture as well as move frequently within the working place compared with the tellers and the clerks. In addition, these employees engage in different tasks that would also mean a difference in the occurrence of musculoskeletal injuries among the employees. According to Korhonen *et al.*, (2003) and Balci and Aghazadeh, (2004), the type of task performed also determine the occurrence of musculoskeletal injuries among employees. In this case, the tellers and the clerks perform more of alphanumeric data entry tasks. These tasks subject the muscular and the skeletal systems to considerable stress. This stress may eventually lead to the development of fatigue which if allowed to accumulate may lead to the development of musculoskeletal injuries and illnesses among the tellers and clerks.

On the other hand, the secretaries and the officers perform more of cognitive tasks that do not subject their muscular and skeletal systems to a lot of stress (Balci and Aghazadeh, 2004). Table 4.2 indicated that the secretaries and the officers were more aware of the work-related risk factors more than the tellers and the clerks. This could be interpreted to mean that the increased awareness of work-related risk factors reduces the occurrence of musculoskeletal injuries among the computer users. When the employees are aware of the risk factors they make it their responsibility to identify the risks, try to develop solutions and evaluate the outcome of measures taken to prevent or control the occurrence of MSI and hence

are able to reduce their occurrence (Rosecrance *et al.*, 1998; Omer *et al.*, 2004; Gerr *et al.*, 2006; Subratty and Korumtollee, 2007).

Figure 4.6 shows the times that the bank employees experienced musculoskeletal injuries at their workplaces.

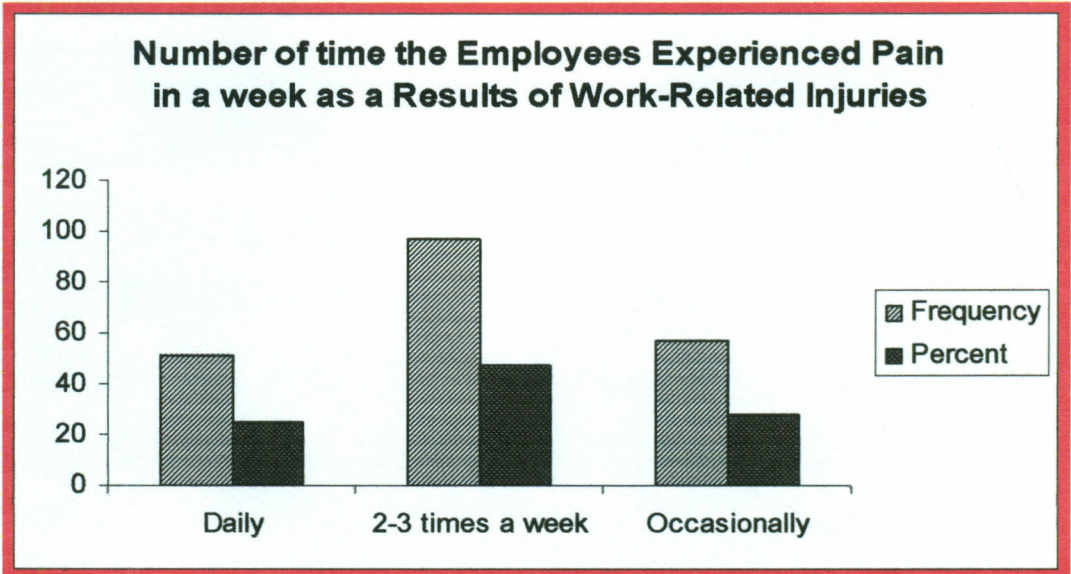


Figure 4.6: Responses on the Times that Pain was Experienced in a Week as a Result of Work-Related Musculoskeletal Injuries

According to the frequency counts, a majority of the bank employees (97; 47.32%) reported 2-3 times of pain experiences while 57; (27.80%) of them experienced the pains occasionally. A smaller proportion of the employees (51; (24.88%) had daily experiences of pain. It is therefore evident that most of the bank employees experienced pain in various body parts 2-3 times in a week and a small proportion of (80; 24.92%) of the employees experienced the pains daily.

This occurrence of pain would cause discomfort among the employees and could lead to either partial or complete absence from the working places. This would cumulatively result to reduced efficiency and productivity in the banking sector (Hagberg, 2004).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter covers the summary, conclusions, and recommendation of the study. This study investigated the awareness of work-related risk-factors, awareness of exercise ergonomics and the prevalence of musculoskeletal injuries and illnesses among the bank employees in Nairobi Kenya. A total of 321 questionnaires were completed, returned and analyzed. The study was carried out in August, September, October and part of November 2007.

Questionnaires were used to gather information on:

- i. The most common work-related musculoskeletal injuries and their prevalence among the employees in banking institutions in Nairobi.
- ii. Awareness of the etiology of the work-related musculoskeletal injuries and illnesses among the bank employees.
- iii. Awareness of the efficacy of ergonomic exercises in reducing the occurrence of MSI among the bank employees.
- iv. Difference among the clerks, tellers, secretaries and officers in terms of their awareness of the work-related risk factors.
- v. Difference among the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises.

- vi. Difference among the clerks, tellers, secretaries and officers in terms of their awareness of the efficacy of ergonomic exercises in the reduction of the occurrence of MSI.
- vii. Difference among the clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses.
- viii. Difference between male and female bank employees in terms of their levels of awareness of the work-related risk factors.
- ix. Difference between male and female bank employees in Nairobi in terms of engagement in ergonomic exercises.
- x. Difference between male and female bank employees in Nairobi in terms awareness of the efficacy of ergonomic exercises in the reduction of MSI.
- xi. Difference between male and female bank employees in Nairobi in terms of prevalence of work-related musculoskeletal injuries.

5.2 Summary of the Findings

- i. There were slightly more female employees (167; 52%) than the male employees (154; 48%) in the banking institutions in Kenya.
- ii. Majority of the bank employees were tellers (108; 33.6%). They were followed in proportion by the clerks (97; 30.2%), the officers (85; 26.5%), and the secretaries (31; 9.7%).
- iii. Most of the bank employees were not aware of work-related risk factors that would predispose them to musculoskeletal injuries and illnesses. 51.40% of

the respondents were not aware of the risk factors while 41.43% of them were.

- iv. There was a significant difference between the male and female bank employees in terms of their awareness of work-related risk factors. 89 (53.57%), and 76 (49.40%) of the female and male employees respectively were not. Smaller proportions of the male (67; 43.61%) and female (66; 39.50%) bank employees were aware. Therefore the male bank employees were more aware of the work-related risk factors more than the female bank employees.
- v. There was a significant difference amongst the clerks, tellers, secretaries and officers in terms of their levels of awareness of work-related risk factors. It was found that the officers (49; 57.65%) were the most aware followed by the secretaries (12; 38.71%), clerks (37; 38.14%) and the least informed were tellers (35; 32.41%).
- vi. Most of the bank employees were not aware of the applicability of ergonomic exercises in the banking institutions. Of the 321 respondents investigated 154 (47.98%) were not aware while 124 (38.63%) were aware.
- vii. There was a significant difference between the male and female bank employees in terms of their engagement in ergonomic exercises during official working hours. Majority of the male bank employees (80; 51.95%) were not aware of how to perform ergonomic exercises in the banking institutions compared to (74; 44.31%) female bank employees who were not

aware. The male bank employees were less engaged than the female bank employees.

- viii. There was a significant difference amongst the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises. It was found that most of the tellers (56; 51.90%) and the clerks (48; 49.5%) were not aware of the applicability of ergonomic exercises. On the other hand, most of the secretaries (21; 67.74%), and the officers (42; 49.41%) were aware.
- ix. Most of the bank employees (128; 39.88%) had no idea that engaging in ergonomic exercises would reduce the occurrence of work-related musculoskeletal injuries and illnesses. A smaller proportion (124; 38.63%) was aware.
- x. There was a significant difference between the male and female bank employees in terms of their views on the efficacy of ergonomic exercises in reducing work-related risk factors. More female (67; 40.11%) than male (61; 39.61%) employees had no idea whether engagement in ergonomic exercises during official working hours would reduce the occurrence of work-related injuries and illnesses.
- xi. There was a significant difference among the different cadre of bank employees in their views on the effects of engaging in ergonomic exercises on work-related musculoskeletal injuries and illnesses. Majority of the tellers (52; 48.10%) had no idea. They were followed in number by the clerks (43; 44.30%), secretaries (13; 41.20%), and officers (20; 23.10%).

- xii. Majority of the bank employees (197; 61.37%) did not engage in ergonomic exercises. Small proportions of 61 (19%), 58 (18.07%), and 5 (1.56%) of the employees exercises once, thrice and more than thrice respectively in a day.
- xiii. Majority of the bank employees (205; 63.86%) experienced musculoskeletal injuries and illnesses. The largest number (276; 86.0%) suffered from lower back problems followed by those who had computer vision syndrome (229; 71.30%), shoulder pains (214; 66.70%), headaches (204; 63.60%), neck pains (197; 61.40%), painful lower legs (180; 56.10%), and carpal tunnel syndrome (136; 42.40%).
- xiv. There was no significant difference between male and female bank employees concerning the prevalence of work-related musculoskeletal injuries and illnesses. Though a slightly larger proportion of the male bank employees (99; 64.20%) than the female bank employees (106; 63.67%) suffered from work-related injuries and illnesses this difference was not statistically significant.
- xv. There was a significant difference amongst the bank clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses. It was found that the officers (37; 43.78%) were the least affected followed by the secretaries (16; 52.95%), clerks (67; 69.17%) while the most affected were the tellers (85; 78.70%).
- xvi. A large number of bank employees (97; 47.32%) experienced pain as a result of the work-related musculoskeletal injuries and illnesses 2-3 times in

a week, 57 (27.80%) experienced the pains occasionally while 51 (24.88%) experienced the pains daily.

5.3 Conclusions

The following conclusions were drawn based on the findings of the study:

- i. There are slightly more female bank employees than the male bank employees in the banking institutions in Kenya.
- ii. Majority of the bank employees were tellers followed by clerks, officers and secretaries.
- iii. Most of the bank employees were not aware of work-related risk factors that would predispose them to work-related musculoskeletal injuries and illnesses. In addition, there was a significant difference between the male and female bank employees in terms of their awareness of work-related risk factors, the male bank employees being more aware than the female bank employees. In addition, there was a significant difference amongst the clerks, tellers, secretaries and officers in terms of their awareness of work-related risk factors. It was found that the officers had the highest level of awareness followed by the secretaries, clerks, and the least informed were the tellers.
- iv. Most of the bank employees were not aware of the applicability of ergonomic exercises in the banking institutions as well as its efficiency in the control of musculoskeletal injuries and illnesses. There was a

significant difference between the male and female bank employees in terms of their engagement in ergonomic exercises during official working hours. Majority of the male employees were not aware of the applicability of ergonomic exercises in the banking institutions. The male bank employees were less engaged than their female counterparts. Also there was a significant difference amongst the clerks, tellers, secretaries and officers in terms of their engagement in ergonomic exercises. It was found that most of the tellers and the clerks were not aware of the applicability of ergonomic exercises. On the other hand, most of the secretaries and the officers are aware.

- v. Most of the bank employees have no idea that engaging in ergonomic exercises would reduce the occurrence of work-related musculoskeletal injuries. However a small proportion was aware. There was a slight difference between the male and female bank employees in terms of their views on the efficacy of ergonomic exercises in reduction of work-related risk factors. More female bank employees had no idea whether engagement in ergonomic exercises during the official working hours would reduce the occurrence of work-related musculoskeletal injuries and illnesses. There is also a difference among the various cadres of bank employees regarding their views on the role of ergonomic exercises in alleviating and preventing work-related musculoskeletal injuries and

illnesses. Majority of the tellers had no idea followed by the clerks, secretaries and officers.

vi. Majority of the bank employees did not engage in ergonomic exercises.

Small proportions of the employees however, exercised once, more than thrice and thrice a day.

vii. Majority of the bank employees suffered from musculoskeletal injuries and illnesses. The largest number had lower back problems followed by those who suffered from computer vision syndrome, shoulder pains, headaches, neck pains, lower leg pain, and carpal tunnel syndrome. There was no significant difference between the male and female bank employees in the prevalence of work-related injuries and illnesses. Though a slightly larger proportion of the male bank employees suffered from the work-related injuries and illnesses this difference was not statistically significant. However, a significant difference existed amongst the clerks, tellers, secretaries and officers in terms of prevalence of work-related musculoskeletal injuries and illnesses. It was found that the officers were the least affected followed by secretaries, clerks and the most affected were tellers.

viii. A large number of bank employees experienced pain as a result of the work-related musculoskeletal injuries and illnesses 2-3 times a week.

ix. Employees' awareness of work-related risk factors influenced the occurrence of work-related musculoskeletal injuries and illnesses. Since

most of the employees were not aware of the work-related risk factors and the ways to manage them, they did not pay attention to these factors; a situation that increased the risks of developing musculoskeletal injuries and illnesses.

- x. Employees' engagement in ergonomic exercises influenced the occurrence of work-related musculoskeletal injuries and illnesses amongst them. Those employees who engaged in ergonomic exercises at work places had less work-related musculoskeletal injuries and illnesses.
- xi. To be able to control and prevent the occurrence of work-related musculoskeletal injuries and illnesses as well as manage and reduce the effects of these MSI, awareness of the work-related risk factors should be combined with training and engagement in ergonomic exercises.

5.4 Recommendations

5.4.1 Recommendations for Policy and Practice

- i. The Kenya Bankers Association in partnership with bank management officers should initiate an in-service education programme for the bank employees to enlighten them on exercise ergonomics.
- ii. The Kenya Bankers Association in partnership with the bank management should set up an ergonomically sound workplace. This step would improve the comfort and safety of the employees which

would in turn lead to the control and prevention of the occurrence of work-related musculoskeletal injuries among their employees as well as boost efficiency and productivity.

- iii. The Kenya Bankers Association in partnership with the bank management should invest in ergonomically sound chairs, desks, computers as well as computer keyboards and mouse.
- iv. The Kenya Bankers Association in partnership with the management of the banks should initiate a training programme that incorporates training on exercise ergonomics for new trainees.
- v. The Kenya Bankers Association should partner with the management of the banks to set up a board that would be mandated to supervise training, evaluation and improvement of exercise ergonomics measure undertaken by the banks. It should be mandated to take disciplinary measures against any banking institution that violates the set guidelines for its operations.
- vi. The Kenya Bankers Association in partnership with the management of the banks and the government should formulate ergonomics laws to ensure that both the employees and the employers are safeguarded from the risk of musculoskeletal injuries and illnesses.
- vii. The banks should hire the services of health and fitness experts to give technical guidance to their employees on matters of health.

5.4.2 Recommendations for Further Research

- i. Research should be carried out to establish a cause-and-effect relationship between specific work-related risk factors and musculoskeletal injuries and illnesses in Kenya.
- ii. A similar study should be conducted among computer users in non-banking institutions.
- iii. There is need to establish the effect of specific ergonomic exercises on work-related musculoskeletal injuries in order to improve the efficiency and specificity of training.
- iv. There is need to establish the most effective ergonomic exercises and duration for ergonomic training in order to achieve utmost benefits. This would facilitate training and enhance standardization.

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APPENDICES

APPENDIX A: A SAMPLE OF THE LETTER USED FOR THE REQUEST FOR RESEARCH ASSISTANCE

Chief Executive Officer, Head Office

.....Bank

Dear Sir/Madam,

Subject: REQUEST FOR RESEARCH ASSISTANCE TO LUKA B. WAIGANJO

The above named person who is the bearer of this letter is a post-graduate student at this department pursuing Master of Science Degree in Physical and Health Education. As a requirement for the award of this degree he wishes to conduct a survey on the levels of awareness of work-related factors that would lead to the development of the same among the Kenyan bank employees.

Musculoskeletal injuries and illnesses among bank employees may lead to reduced productivity due to increased discomfort, medication, time off for injury, and early retirement. The findings of this survey will assist in establishing the current status of this phenomenon and this may lead to the formulation of fitness guidelines and programs for the prevention of musculoskeletal illnesses and injuries amongst the bankers. The information gathered will be treated with strict confidentiality and will not be disclosed to any other organization or institution.

The tellers, secretaries, clerks, and computer analysts will be requested to complete a questionnaire seeking their views on those issues. The procedure will not endanger them and will be tailored to suit the banking procedures without much interference.

By this letter, we therefore request your invaluable assistance by allowing Mr. Waiganjo to administer the said research questionnaires. This will thus enable him accomplish his M.Sc course as required.

Thank you most sincerely in advance.

Dr. Mwangi P. Wanderi

Ag Chairman

DEPARTMENT OF EXERCISE, RECREATION, AND SPORTS SCIENCE

KENYATTA UNIVERSITY

APPENDIX B: SUBJECTS INFORMATION

Dear Participant,

RE: Request for Research Assistance

I am a post-graduate student at Kenyatta University and required to carry out a research to be awarded Master of Science Degree. I kindly invite you to participate in an investigation that seeks to establish the levels of awareness of the causes of work-related musculoskeletal injuries and the use of exercise to prevent or control the same among the bank employees in Kenya. I believe this investigation is of potential importance because it will assist in the formulation of exercise programs for the bank employees to assist in the maintenance of their comfort and productivity in their career. The investigation will involve completing a questionnaire seeking information about yourself and your working environment. All the information collected will be treated with the strictest confidence. The researcher will not reveal any detail to any other organization; and the data will not be used for any other purpose other than that stated.

Luka B. Waiganjo

APPENDIX C: CONSENT FORM

As the undersigned, I give my consent to the research procedure outlined above.

Signature..... Date.....

I would respect your concerns and decision if you opted not to participate in the study. If you have concerns about the procedure you may contact:
Luka B. Waiganjo, Kenyatta University, Department of Exercise, Recreation and Sports Science, P.O Box 43844, Nairobi-Kenya.
0723812849 (cell phone), E-mail: lukawaiganjo@yahoo.com

APPENDIX D: DEMOGRAPHIC QUESTIONNAIRE

The questions below are seeking your opinions about your experiences at your workplace. Please put a tick against the answer that best represents your view(s).

1. Age: Below 30 30-35 36-40 40-50 50>

2. Gender: Male Female

3. What is your position in the bank?

Teller Clerk Secretary Officers

4. For how long have you been working in a banking institution?

...Years/.Months

APPENDIX E: ERGONOMICS QUESTIONNAIRE

1. Do your head and neck need to be upright or in-line with your upper body and not bent downwards or backwards when operating the computer?

Yes No idea No

2. Does your trunk have to be perpendicular to the floor and only lean back into the backrest but not forward while operating the computer at your off desk?

Yes No idea No

3. Do your shoulders and upper arms need to be relaxed and in-line with the upper body, normally about perpendicular to the floor and not elevated or stretched forward while you are operating the computer?

Yes No idea No

4. Do your forearms, wrists, and hands need to be straight and in-line with the forearm at about 90 degrees to the upper arm while keying data into your computer?

Yes No idea No

5. Do both the thighs need to be parallel to the floor and the lower legs to be perpendicular to floor when you are seated at your desk?
Yes No idea No
6. Does the backrest of your chair support your lower back when you are seated and operating the computer?
Yes No idea No
7. Is the seat pan of your chair too long to press against the back of your knees and lower legs when you are seated?
Yes No idea No
8. Is the top of the monitor screen at or below your eye level so that you can read it without bending your head or neck downwards or backwards?
Yes No idea No
9. Does the distance of the monitor allow you to read the screen without leaning your head, neck, or trunk forward or backward when working?
Yes No idea No
10. Is the monitor positioned directly in front of you so that you do not have to twist your head and neck when working?
Yes No idea No
11. Do you ensure that glare, for example from windows and overhead lamps that would make you sit in an awkward posture so as to view the screen better is not reflected on your screen?
Yes No idea No
12. While doing telephone and computer tasks simultaneously, do you keep your head upright and your shoulders not elevated?
Yes No idea No
13. Do your workstation and equipment have sufficient adjustability that ensures your safe working posture while allowing you to make occasional changes in posture when you work on your computer?
Yes No idea No
14. Are your computer tasks planned in a way that allows you to vary tasks, or to take micro-breaks or recovery pauses while at the workstation?
Yes No idea No

15. Do you experience pain or discomfort in these body parts during or after office work?

- | | | | | |
|-------------------------|-----|--------------------------|----|--------------------------|
| 1. Eyes | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 2. Head aches | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 3. Neck | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 4. Shoulder | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 5. Wrists/hands/fingers | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 6. Lower back | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 7. Ankle/lower legs | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |

16. If your answer is yes in any of the above, how often do you experience it?

- | | | | | |
|------------------|-----|--------------------------|----|--------------------------|
| Daily | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 2-3 times a week | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| Weekly | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| Occasionally | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |

17. In your opinion, can stretching exercises be done in the bank setting during the official working hours?

- Yes No idea No

18. Do you think stretching the body during the working hours is important?

- Yes No idea No

19. Do you ever stretch as you execute your banking tasks?

- Yes No idea No

20. If you do stretch, how many times in a day

- Once Thrice More than thrice

21. In your opinion can stretching exercises in the workplace reduce the occurrence and severity of injuries?

- Yes No idea No

APPENDIX F: ERGONOMIC EXERCISES

Set One:

Neck: Tilt your head to one side (ear to shoulder); hold; relax; repeat on other side.

Shoulders: Slowly bring shoulders up to the ears and hold briefly.

Wrist: Hold arm straight out in front of you; pull hand backwards with other hand, then pull downward; hold; relax; repeat with other hand.

Eye

Palming: The palming exercise will teach you to relax your eyes, which in turn will bring healthy energy to your eyes. First, rub your hands together until they feel warm (about 15 to 20 seconds). Then place your cupped hands over your closed eyes, being careful not to touch your eyes with the palms of your hands. The fingers of each hand should overlap and rest gently on the center of your forehead. Don't create any unnecessary pressure on your face. If your arms get tired, rest your elbows on a table. Sit quietly for one to two minutes with your hands over your eyes. The more relaxed you become, the blacker the darkness you will see with your eyes closed.

Near-far focus: this exercise improves eye flexibility: Focus on an object about 10 feet away. Then focus on an object that is far away, preferably through the window. Take another deep breath and slowly exhale.

Scanning: this exercise helps you increase the flexibility of your eyes. Sitting or standing at one end of a room, let your eyes scan around the edges of objects in

the room - clocks, televisions, doors, lights, computers, etc. The object of this exercise is to keep your eyes moving in a loose and fluid way.

Hydrotherapy: place a bowl of hot water and a bowl of cold water in front of you. The hot water should be hot but not so hot that it burns you. The cold water should be ice cold, so either put ice cubes in it or get it out of the refrigerator. Put a washcloth in each bowl. Place the washcloth from the bowl of hot water against your closed eyes for 30 seconds. Then do the same with the washcloth from the bowl of cold water. Continue to alternate the hot and cold washcloths. Finish by gently massaging your closed eyes with a dry towel. Do this for two minutes.

Head Rolls: this exercise is to relax your neck, head and face muscles and reduce shoulder tension.

(New York Reuters, 2004).

Set Two:

Eye stretches

Cup them: Cup your hands and place them lightly over your closed eyes. Hold for a minute, while breathing deeply in and out. Slowly uncover your eyes.

Roll Them: Close your eyes and slowly roll your eyeballs clockwise all the way around. Repeat three times. Now slowly roll them all the way around counterclockwise. Repeat three times.

Look Away: Look away from the computer screen every half hour. Focus on an object at least 20 feet away. Look back at the screen, then look away and focus again. Repeat three times.

Hand, Elbow, and Shoulder: While sitting or standing, gently push elbows back with arms parallel to the floor; Push palms forward while extending arms; spread fingers apart; and Repeat three times.

Shoulders: While sitting or standing, push elbows back. Hold for 5 seconds. Repeat 3 times.

While sitting or standing: Relax shoulders. Roll them forward 5 times. Roll them backward 5 times. Repeat as needed.

While sitting or standing: Stand and stretch arms outward on the sides. Make small gentle circles with your arms. Repeat 5 times. Advance to larger arm circles.

Triceps: While sitting or standing, bring one arm in front of you and bend your elbow while placing hand over opposite shoulder. Gently push elbow toward chest for about 20 seconds. Repeat on the other arm.

Legs: While seated. With your back supported by a chair, extend one leg. Repeat on other leg.

Neck: Place your right hand on top of your head, let your neck gently stretch toward the shoulder. Hold stretch for about 20 seconds. Repeat 3 times on each side.

Turn your head and look over your shoulder slowly and gently. Hold for 5 seconds. Repeat 3 times on each side.

Lower back: With your back supported by a chair and one foot on the ground, use both hands to gently pull your knee toward your chest. Hold for 5 seconds. Alternate the legs. Repeat 3 times.

Push your chair a full arm stretch away from your desk. Lean forward and try to touch the floor. Return to sitting position. Repeat as needed.

Stand with your hands supporting your low back. Gently arch your back. Hold for 5 seconds. Repeat as needed.

Upper Back and Shoulders: Move one arm overhead and then the other in a climbing motion. Repeat 5 times.

With your right elbow up and bent, circle your shoulder forward and then backward. Repeat 5 times on each side.

More Exercises:

Sit up straight and pull shoulders back; Slide head straight back on neck; Keeping face pointed forward; Isolate movement to head and neck; Repeat 4-5 times

Standing or sitting, eyes looking forward; without dropping head, pull face in to make a double chin; Hold for count of 5; Repeat 10 times.

Sit up straight and pull shoulders back; Slide head straight back on neck; Keeping face pointed forward; Isolate movement to head and neck; Repeat 4-5 times

Sit relaxed, with feet flat on the floor; imagine a cable attached to the top of the head, pulling up; Hold for count of 3; Relax; Repeat 3 times.

Tuck the chin in, shoulders back and "sit tall"; Hold the position for a count of 3; Relax

With arms bent across the chest, Push elbows back while stretching head up; Repeat 7-15 times.

Rotate both shoulders backwards, keeping arms relaxed by sides. Pull shoulders back, arms at sides; Hold for count of 3.

Rotate each foot from ankle three times in one direction then three times in the other direction

Sitting in chair, lift right leg, hold out straight; then move foot up and down from ankle 10 times; Circle foot to right 10 times; Then to left 10 times; Repeat with left leg

Sitting erect in chair, Press down alternately with ball and heel of right foot several times; Repeat with other foot.

(NIOSH,1997).

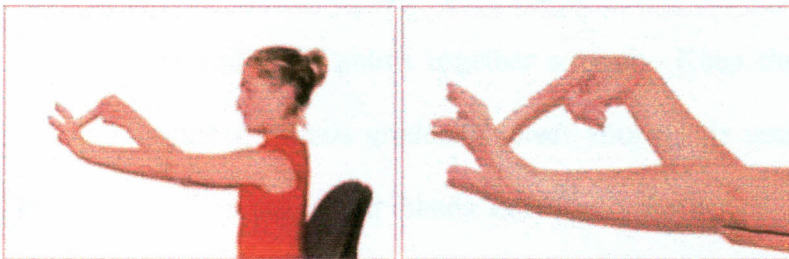
Set Three

Take a deep breath and close your eyes. On the exhale, slowly drop your chin to your chest. Relax your neck and shoulders. As you inhale deeply again, slowly and gently roll your head around to the left, then back, keeping your shoulders still and relaxed. Make your movements slowly, carefully and deliberately. Now exhale full as you roll your head to the other side and down to your chest again. Repeat this sequence twice then change directions and repeat twice more. With your eyes closed, slowly move your eyes to the right, to the left, up, and then down. See below.



(<http://www.ergonomicsnow.com.au/exercise/eyes.htm>)

The Hand Exercise (Finger & Wrist Stretch)



Starting with the right hand gently extend the fingers back one by one.



Then take them all back at the same time. This helps to stretch open your palm.

Repeat several times. See fig 3 & 4

Take your thumb back towards your wrist. Then bring it forwards, stretching gently and firmly. Never force it.



Finish by making a fist and slowly opening it, stretching your fingers and thumb out as far as you can.

Put your palms together, fingers pointing upwards, as if you were praying. Stretch your fingers and press palms together strongly. Keep the bases of your palms pressing together, as you gradually lower your hands until your lower arms are horizontal. Then take your hands down still further, fingers and upper palms together. You should feel the stretch on the insides of your fingers and wrists. Hold for a few seconds, and then repeat.

Benefits: Loosens stiff fingers, hands and wrists. Completed daily for a few months, hands will become more flexible.



(<http://stretchnow.com.au/exercise/hand.htm>)

Set Four

Shoulder shrugs: with arms hanging by your sides, raise your shoulders upwards and hold, then let them drop down and relax. Repeat.

Neck rolls: looking forward, slowly allow your head to relax to the left side, bringing your ear towards your shoulder, stretch and hold before straightening. Repeat with the right side. Pull your chin in and lower towards your chest, hold then turn your head slowly to the right to look over your shoulder, hold and turn back slowly to the center. Repeat turning the left.

Neck flexion: drop your head forward, interlock your fingers and rest on head, allowing the weight of your relaxed arms to help the head towards the chest.

Neck extension: interlock your fingers behind your neck, and support it while you look slightly upwards.

Reach ups: interlock your fingers; turn your palms away from you. Straighten your arms and reach upward over your head and slightly back as far as you can, to increase the stretch.

Reach outs: interlock your fingers with palms facing forward, push out as far as possible, allowing the shoulders to round forwards.

Chest stretch: (sit or stand) with elbows bent, interlock your fingers behind our back; straighten your arms, turning your elbows slightly in, squeezing your shoulder blades together. Gently raise your arms to increase the stretch.

Side bends: interlock your fingers behind your head. Make sure your feet are placed in line with your shoulders, and then lean over to one side to stretch. Stretch upwards with the top elbow.

Back extension: sit upright with your hands placed into the small of your back. Push your hips forwards and your shoulders back, arching the spine.

Knee raise: sitting upright, take one knee and raise it towards your chest. Hold for up to 20 seconds. Rest and repeat with the other knee

(Anderson, 1997).

Set Five

Upper body Stretch



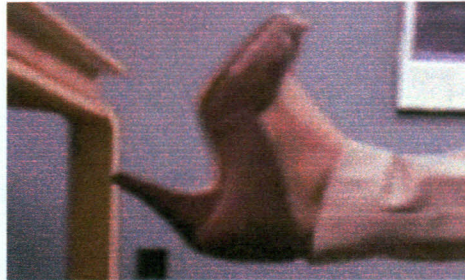
Exercises for the Neck



Shoulder Exercises: Sit straight and bring shoulders up toward ears;
Hold for count of 3; Relax and repeat



Knee and Lower Leg Exercises: While sitting, point toes downward as far as possible; Hold three seconds; Point toes straight up and hold three seconds; Repeat three times.



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Set Six: Body Part Squeeze

Trunk: Inhale, then exhale and bring your chest and pelvis toward each other by using your abdominals. Let this movement travel to its destination on the flow of your exhale. Inhale and come back to form.

Neck and shoulders: On the exhale, bring your shoulders in toward the center of your body, and also raise them in the direction of your head.

Legs: Position yourself by wrapping your arms around one shin then bring your leg in closer to your body. Repeat with the other leg.

Feet: Inhale, then exhale and curl your toes under and contract the muscles on the bottom of your feet. Inhale again and relax your feet back to normal.

Sitting, feet on the floor and hands on knees, extend legs and arms to full stretch, fingers and toes extended, then sit back and rest. Repeat this several times.

Sitting, alternate toe touching, gentle stretching movement, one hand to alternate foot, other hand above head. The head should look up to the raised hand

Sitting, hands behind back, one over the shoulder, the other from behind the back, try to link hands. Change sides and repeat

Hold a fist for 2 to 3 seconds, and then hold fingers stretched for 2 to 3 seconds.
Rotate the thumbs both Clockwise and anti-clockwise

While sitting, with your elbows up and hands behind the head, pull the elbows back and stretch up, then bring elbows to meet at the front. Repeat this action several times

While sitting, with the elbows at shoulder height, bend your arms to touch your shoulders and extend. Repeat this several times

While sitting, with your elbows up and hands behind the head, pull the elbows back and stretch up, then bring elbows to meet at the front. Repeat this action several times

While sitting, with the elbows at shoulder height, bend your arms to touch your shoulders and extend. Repeat this several times

While sitting with your hands joined and extended above your head, relax the head and gently side bend to the left and right, keeping the body straight

While sitting, relax your shoulders, then shrug and shorten the neck. Repeat this action several time several times

While sitting with both hands behind the back, one palm between shoulder blades, try with the other hand to push down the elbow of the opposite hand. Change sides to include both sides and repeat several times.

While standing or sitting; turn your head to the right and to the left keeping the head up and back straight. Repeat this movement several times.

Move arms overhead in climbing motion. Repeat 10x each side. Circle shoulders forward, then backward. Repeat 10x each direction.

When you feel your eyes have adjusted (3-5 seconds), focus on another object that is midway between the object you just focused on and your computer screen.

Stare at each point long enough for your eyes to become comfortable. If you do not have a window in your workspace, then use the space you have or walk to where you have a longer view.

Blink your eyes often and take a break by alternating tasks when necessary and whenever possible.

Set Seven

Arm Across Chest

This will stretch out your shoulders, upper arms and upper back and improve your posture whilst you work on your computer. Place your right arm across your chest, and your left hand just above your elbow. Pull your arm across chest and hold for 10 seconds. Relax, and then repeat on other arm.

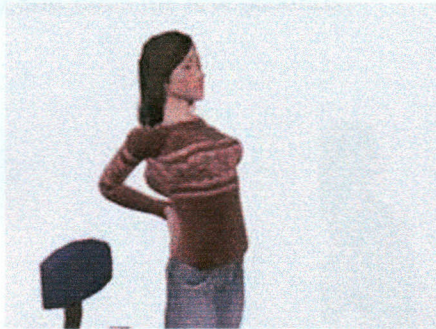


Arm Massage

This will massage your arms. By loosening these muscles your blood flow will improve and help flush out the toxins released when typing. Roll up your sleeves. Using your thumb and fingers, massage both sides of your arm from elbow to hand. Repeat on other arm.

Backwards Lean

This exercise helps stretch the back muscles. When you sit your posture tends to hunch due to gravity. By stretching your back you prevent poor sitting posture. Stand with your feet shoulder width apart and hands on lower back. Looking straight ahead, slowly lean back, keeping legs straight.



Bend Head Forwards

This stretch is useful for the upper back and neck which are common areas of tension.

Bend head forward and gently push down until you feel a comfortable stretch. Relax, and repeat several times.



Calf Stretch

Prolonged sitting can lead to poor blood circulation in the lower limbs. This exercise will help move stale blood out of the lower limbs and will help to keep the calf muscles flexible.

Raise one leg so that it is straight. Point the toes towards you. Hold for few seconds then point away and hold for few seconds.



Double Chin

This stretch repositions the discs and vertebrae of the neck. Usually computer users push out their chin as they strain to see the monitor. Sit up straight, looking

straight ahead. Slowly draw chin backwards into the neck, hold for 5 seconds.

Repeat 5 times.



Eye Blackout

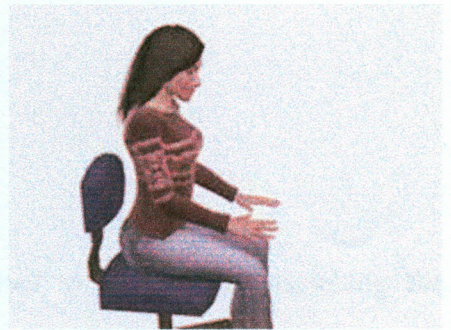
Computer users blink less when they work on their computer focusing on the screen. This stretch helps lubricate the eye and help relieve dry eyes. Close your eyes, and cover them with your hands. Keep them closed for 20 seconds.



Finger Stretch and Clench

This stretch helps loosen the tightening of the hand muscles which occurs when you type for prolonged periods of time. This exercise is imperative to prevent/recover

Spread the fingers of both hands as far apart as possible. Make a tight fist and squeeze. Repeat several times.



Forward Back Stretch

This exercise helps stretch the back muscles. When you sit your posture tends to hunch due to gravity. By stretching your back you prevent poor sitting posture. Place your feet shoulder width apart. Slowly bend forward, bringing your hands towards the floor. Keep hands close to chair, and relax your head.



Hip Stretch

This stretches the lower back muscles and helps reposition the lower back. Place one leg over opposite thigh, hands on ankle and knee. Slowly lean forward until you feel a comfortable stretch. Hold for 10 seconds. Repeat on other leg.



Knee Hug

Muscle tightness in the thighs often contributes to back pain. Stretching the hamstring muscles helps alleviate tension in these muscles. Sit straight in your chair. Interlace fingers over right knee. Pull your knee towards your chest, and hold for ten seconds. Repeat twice for each leg.



Neck Tilt

This exercise will stretch the upper shoulder and neck muscles. This will allow easier head movements and improve blood circulation. Sitting straight in your chair, tilt the head towards one shoulder as far as you can without straining.



Reaching Forward

Prolonged sitting can damage musculoskeletal system. This exercise improves upper back, shoulders and elbows. Interlace your fingers. Push the palms of your hands forward. Hold for 10 seconds. Repeat twice.



Scan Horizon

Focusing on the screen puts load on your eye muscles. Wandering over distant objects relaxes the eye muscles and relieves eye fatigue. Spend 15 seconds looking at an object more than 10 feet away. Maybe out through the window or down a hallway.

Shoulder Circles

This exercise helps stretch chest muscles and strengthens upper back muscles. Rotating your shoulders in this way prevents poor posture. Stand up, slowly roll your shoulders backwards in large circles 10 times, looking straight ahead



Shoulder Fan

This exercise stretches the chest, correcting hunching posture and activates upper back muscles that become slack without activity. Interlace your fingers. Place your hands behind your head with elbows out to the side. Pull your shoulder blades together and push your chest out and hold for 10 seconds.



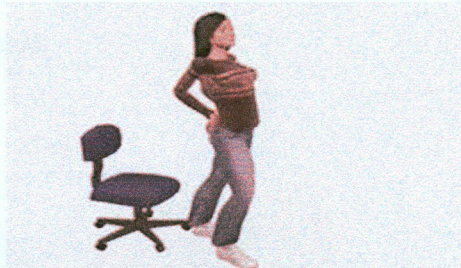
Flying Fingers

This stretch helps loosen the tightening of the hand muscles which occurs when you type for prolonged periods of time. Let your arms hang by the side of your chair. Wiggle your fingers for 15 seconds



The Fencer

Prolonged sitting leads to hip muscle shortening. Changing your posture to standing benefits your legs and back. Stand up, step forward with the right leg and place your hands on your hips. Slowly bend your right knee, pushing your hips forward and keeping the left leg straight. Hold for 10 seconds; perform 3 times for each side.



(RSI Warrior, 2003)

Neck Stretch.

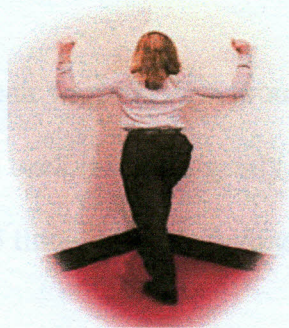
Tilt ear toward shoulder. Reach up and touch the top of the head with the palm. Hold the head in tilted position for 10 seconds. Repeat 2-3 times (come out of stretch very slowly.) Reverse sides.



Pec Corner Stretch

Stand at a corner about a foot away from the wall with forearms on opposite sides of the corner. One foot should be forward. Elbows should be slightly below shoulder height.

Keep abdominals tight to avoid arching the back. Lean gently towards the corner by bending the front knee until a stretch is felt in front of the chest. Hold 15 seconds. Repeat 2-3 times.



Overhead Reach

Take a deep breath and reach up over head with both arms. Hold a couple of seconds.

Exhale and lower slowly. Repeat 5 times.



Shoulder Pinch

Place the arms behind the head being careful not to press the hands into head. Relax the shoulders and squeeze the shoulder blades together while keeping shoulders and the back down. Hold 5 seconds. Repeat 5 times.



Chair Rotation Stretch

Sit on the chair and if you can wrap the feet around the legs of the chair. Reach across the body and grab the back rest. Pull gently to increase stretch in mid back. Hold for 5 seconds. Repeat 5 times while changing sides.



Arms behind Back Stretch

Hold hands behind the back, and grasp hands together. Pull shoulder blades back and down. Hold 5 seconds. Repeat 5 times.



Forearm Stretches

With wrist flexed and fingers straight, hold one arm straight at waist height. With fingers of other hand, gently press the wrist down above the knuckles. Do not hold at the fingers to push down. Hold for 5-10 seconds. Keep shoulder relaxed when stretching. Repeat 2-3 times then change hands.



Wrist extended/ fingers point up

Hold arm straight at waist height with palm facing away from you and fingers pointing up. Hold the palm of the other hand and stretch the wrist backwards. Do not pull on the fingers. Hold 5-10 seconds. Repeat 2-3 times then change hands.



Wrist extended/ fingers point down

Do as above, but with fingers pointing towards the floor. Hold 5-10 seconds. Repeat 2-3 times. Change hands.



(Ucla Ergonomics Flexibility/Stretching Exercises/

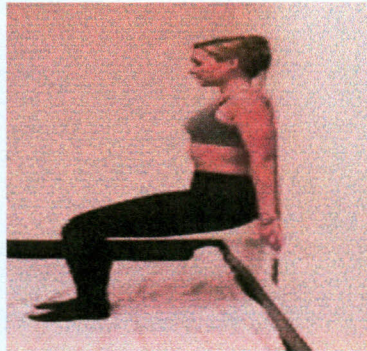
<http://ergonomic.ucla.edu/oldergo/ergoweb2.0/articles/exercise.htm>)

Waxing

Sit up straight with elbows at sides and bent to 90 degrees (right angle). Push shoulders together and down with palms facing the floor. Make a waxing motion in the air while maintaining the above position. Keep elbows "glued" to sides while completing the motion. Do this for 20 seconds.

Wall Slides

Stand with the buttocks and the back against the wall. Bring the feet to 12 inches from the wall. Keep back against the wall. Lower down until the knees are bent to about 60 degrees keeping abdominals tight. Rise back up to where knees are slightly bent. Do 5 repetitions.



Sit and Stand

Sit at edge of chair with feet slightly behind the knees. Stand up while keeping the neck and spine erect. The back should not bend forward. Immediately return to sitting, but do not put full weight on chair. Do 5 repetitions slowly.



(Ucla Ergonomics Postural Strengthening Exercises/

<http://ergonomic.ucla.edu/oldergo/ergoweb2.0/article/postural.htm>)