T.C.

YEDİTEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF PHYSIOTHERAPHY AND REHABILITATION

THE COMPARISON OF THE FEATURES OF OFFICE WORKERS' MUSCULOSKELETAL DISCOMFORT ACCORDING TO GENDER: WORKING ENVIRONMENT, POSTURE AND PHYSICAL ACTIVITY LEVEL

MASTER OF SCIENCE THESIS

B. Sc. AYŞE ALPARMAN, PT

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Prof. Dr. H. Serap İNAL, PT

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ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun 16/07/2019 tarih ve 2019/12-30 sayılı kararı ile onaylanmıştır.

Prof. Dr. Bayram YILMAZ
Sağlık Bilimleri Enstitüsü Müdürü

DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

Ayşe ALPARMAN

Signature

DEDICATION

I would like to dedicate my thesis to my beloved and loving parents Şölen and Oğuz ALPARMAN.

ACKNOWLEDGEMENT

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CMDQ	Cornell Musculoskeletal Discomfort Questionnaire
CSA	Canadian Standarts Association
DHW	Duration of Housework
IPAQ-LF	International Physical Activity Questionnaire – Long Form
IPAQ-SF	International Physical Activity Questionnaire – Short Form
IR	Interquartile Range
MSD	Musculoskeletal Disorder
MSI	Musculoskeletal Injury
NIOSH	National Institute of Occupational Health and Safety
NFM	Number of Family Member
NYPRC	New York Posture Rating Chart
PA	Physical Activity
PAL	Physical Activity Level
ROSA	Rapid Office Strain Assessment
SD	Standart Deviation
SPSS	Statistical Package Analyze for Social Sciences
WRMSD	Work-related Musculoskeletal Discomfort
WRNULD	Work-Related Neck and Upper Limb Disorders
WSH	Workload Sharing of Household
VDT	Video Display Terminal
VDU	Visual Display Units

ABSTRACT

Alparman, A. (2019). The Comparison of the Features of Office Workers' Musculoskeletal Discomfort According to Gender: Working Environment, Posture and Physical Activity Level. Yeditepe University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, MSc. Thesis. Istanbul 2019.

Between January 20 and May 6, 118 volunteers; 67 women, mean age 34.2 ± 6.92 and 51 men, mean age 34.2 ± 6.89 participated in this study. In the study, the participants were evaluated once by question-answer and observations. According to the sociodemographic questionnaire, body-mass index of the participants was 22.67 ± 3.76 in women and 25.57 ± 3.32 in men. The total MET-min/week value of sitting during the day was 5688.13 ± 865.13 in women and 6193 ± 1119 MET-min/week in men. While the mean of occupation years is 10.5 ± 6.70 in women, it is 9.66 ± 6.2 in men. There was no statistical homogeneity between the groups.

In our study, a specific questionnaire including sociodemographic characteristics of the participants was applied. In addition, to assess the musculoskeletal injuries of the participants, the Cornell Muscleskeletal Discomfort Questionnaire, office ergonomics risk factors were assessed by the Rapid Office Strain Assessment, postural evaluation by the New York Posture Rating Chart, and physical activity level was assessed by the International Physical Activity Questionnaire-short form.

In this study, when we were analyzing the office ergonomics values, no significant difference was found between women and men (p<0,05). There was no statistically significant difference in total postural differences, but there was a significant difference in trunk scores (z=-2,762;p=006). When we look at the duration of house work (z=-2,184;p=,029) and the workload sharing of household(z=-3,301;p=,001), a significant difference was found between women and men.

In conclusion, no significant difference was found between women and men in terms of musculoskeletal disorders. There was a negative correlation between height (r=-,193;p=,036) and total physical activity value (r=,199;p=,031) according to risk factors of office ergonomics. There was a positive correlation between the upper part scores of posture evaluation and peripheral component of risk factors (r=,231;p=,012). New york posture total values were positively correlated with physical activity (r=,197;p=,033), while a negative correlation was found between the duration of house work (r=,200;p=,030). Physical activity scores were negatively correlated with the duration of house work (r=-, 238;p=010); and there was a positive correlation (r=,218;p=018) with the trunk score of the posture.

Key Words: Gender Differences, Musculoskeletal Disorders, Office Ergonomics Risk Factors, Postural Changes, Physical Activity Level

ÖZET

Alparman A.(2019). Ofis Çalışanlarında Kas İskelet Sistemi Yaralanma Nedenlerinin Cinsiyete göre Karşılaştırılması: Çalışma Ortamı, Postürel Değişiklikler ve Fiziksel Aktivite Düzeyi. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Yüksek Lisans Programı. Yüksek Lisans Tezi. İstanbul 2019.

Bu çalışmaya 20 Ocak – 6 Mayıs tarihleri arasında sigorta şirketi çalışanlarından 34,2 ± 6,89 yaş ortalamasında 67 kadın ve 34,2 ± 6,42 yaş ortalamasında 51 erkek olmak üzere 118 kişi gönüllü olarak katılmıştır. Çalışmada, katılımcılar bir kere olmak üzere soru-cevap ve gözlemler yapılarak değerlendirilmiştir. Yapılan sosyodemografik ankete göre katılımcıların beden-kitle indeksi kadınlarda 22,67 ± 3,76 ve erkeklerde 25,57 ± 3,32 çıkmıştır. Gün içinde oturarak geçirdikleri toplam MET-min/week değeri ortalama olarak kadınlarda 5688,13 ± 865,13 bulunmuş olup, erkeklerde is 6193 ± 1119 MET-min/week bulunmuştur. Meslek yılı ortalamaları ise kadınlarda 10,5 ± 6,70 iken, erkeklerde 9,66 ± 6,2'dir. Gruplar arasında istatistiksel olarak homojenlik yoktur.

Çalışmamızda katılımcıların sosyodemografik özelliklerini içeren spesifik bir anket uygulanmıştır. Bunun yanı sıra katılımcıların kas iskelet sistemini yaralanmalarını değerlendirmek için Cornell Kas İskelet Sistemi Yaralanma Anketi ile ofis ergonomisi risk faktörleri Hızlı Ofis Zorlanma Değerlendirmesi ile, postur değerlendirilmesi New York Postür Değerlendirme Testi ile ve fiziksel aktivite düzeyi Uluslararası Fiziksel Aktivite Anketi-Kısa Form ile değerlendirilmiştir.

Yapılan analizlerde Ofis ergonomisi risk faktörlerine bakıldığında kadınlar ve erkekler arasında anlamlı bir fark bulunmamıştır (p<0,05). Posturel farklara bakıldığında total skorlarda istatistiksel olarak anlamlı bir fark bulunmamıştır ancak gövde skorlarına bakıldığında anlamlı bir fark bulunmuştur (z=-2,762;p=006). Ev işlerine ayrılan süre (z=-2,184;p=,029) ve evdeki işlerin iş bölümüne (z=-3,301;p=,001) bakıldığında ise kadınlar ve erkekler arasında anlamlı bir fark bulunmuştur.

Sonuç olarak yapılan çalışmada, kadınlar ve erkekler arasında kas iskelet sistemi yaralanmaları açısından anlamlı bir fark bulunamamıştır. Ofis Ergonomisi risk faktörlerine bakıldığında boy (r=-,193;p=,036) ve fiziksel aktivite total değeri (r=,199;p=,031) ile negatif yönlü anlamlı bir korelasyon bulunmuştur ve postür değerlendirmesinin üst bölüm skorları ve risk analizi perifer skorları arasında (r=,231;p=,012) pozitif yönlü anlamlı bir korelasyon bulunmuştur. New york postür total değerlerine bakıldığında fiziksel aktvite ile arasında (r=,197;p=,033) pozitif yönlü anlamlı bir korelasyon bulunurken, ev işlerine ayrılan süre ile (r=,200;p=,030) karşılaştırılda negatif yönlü bir korelasyon saptanmıştır. Fiziksel aktivite skorlarına bakıldığında ev işlerine ayrılan süre ile negatif (r=-,238;p=010); postürün gövde skoruyla pozitif (r=,218;p=018) anlamlı bir korelasyon bulunmuştur.

Anahtar Kelimeler: Cinsiyet Farklılıkları, Kas-İskelet Sistemi Yaralanması, Ofis Ergonomisi Risk Faktörleri, Postürel Değişiklikler, Fiziksel Aktivite Düzeyi

1. INTRODUCTION

In recent literature, office ergonomics aiming to understand the risks of musculoskelatel injuries and the preventive measures of these risks are among the topics. However, there are contraversary outcomes of these studies. [1-4] As an example, in some studies it is shown that the musculuskeletal discomfort complaints are common in the office workers who are using computer in daily tasks. [1,5] Occupational study numbers present that, the office workers who are using computers and experiencing musculoskeletal discomfort as in percentage between 25-35, however in current studies the discomfort levels presented as high as 63% [6]. With regard to body regions, neck discomfort rates are greater than 35% in office workers, this situation is similar in the shoulder region with a rate of 35%, and followed by wrist area 17% and 8% within hands and elbows.[7] Korhonen et al. [2] reported that neck complaints existed in 34.4% of the office workers. In addition to, the conditions are different nowadays because of the employment in industries are changing to office works from manufacturing work, the office workers are experiencing more musculoskeletal disorders than other workers.[8-10] Thus, in this study, volunteer participants, who are white collar office workers, are going to take part in.

According to the literatur reviews women are more likely to have musculoskeletal discomfort because of extra work at home. In many cultures women are looking after children and housework more than men after work. Men have a chance to relax and rest at home instead of women.[11] Although women and men may have the same job title, they still didn’t perform similar type of work tasks. Compared to men, women are possible affected by heavy, monotonous and repetitive work duties, for example health care professionals, cleaners, cashiers. [12] So the stress factors and workload have a greater impact on women. Particular features of the office workers have also been related to the risk of musculoskeletal discomfort. As an example, the onset of the risk factors of musculoskeletal symptoms and disorders are related to being a women, over the age of 30 years, non-Caucasian, and having a previous history of upper extremity problems. [13] Thus, we aimed to search the gender differences in relation to musculoskelatal discomfort of the participant office workers.

Computer-based jobs have become a more common part of workplaces in recent years. [14] 39% of office workers mentioned that computer usage, composing the daily tasks in their jobs in 1989, and in 1994 this rate is followed with 50%. 60% of office workers reported in 2000, that as a part of their job, the computer was used by the office workers and 80% these workers needed the computer with of those workers needed the computer with daily basis. [15,16] Even manual material handling needs much more effort than computer work, in last twenty years the prevalence of musculoskeletal disorders (MSDs) has increased with the raising number of computer usage in the workplace. It has been reported that anywhere between 10% and 62% of office workers, who is using computers, experience the symptoms of musculoskeletal disorders as a conclusion of their work. Risk factors related to the usage of MSD onset in computer workers include the presence of non-neutral habitual postures of the upper segments, as well as prolonged static sitting tasks. [1,3,6]

Impaired postures are defining with the repetitively or for long durations exposuring the poor positions of an office worker which is resulting with increased risk of fatigue, pain or injury. These habitual postures can take two different forms; one is actively in the form of muscle contractions, or the second is passively in the form of bones, muscles, tendons, ligaments. [17] The energy is required for muscle activation and as a result of muscle contraction, muscles produce waste products of metabolism. If sufficient magnitude of contractions can not be maintained, muscles blood circulation is decreased, the supply of oxygen will be limited and and waste products will stay in the muscles. Fatigue and pain will occur in the muscles,respectively.[18] Feelings of pain or numbness or pain could be seen when the passive loading stresses the tissues and may result to tissue strain. [19]

In less-than ideal office design with limited space, workers generally have to do their tasks in a sedentary and repetitive positions against a computer for hours. In addition, the nature of the job duties may also affect the ideal posture and patterns of movement in upper extremities. The cumulative effects of office work requiring static posture can make a significant contribution to the development of musculoskeletal disorders. [20,21] Thus, we aimed to observe the postural differences of the participants and search weather these are related with their office environment or not.

Sedantary lifestyle is affected by office work to overall in a bad way and the office work is related to the health risks accoding to the sedantary behaviour. [22,23] Additionally, when compared to time not working, occupational sedentary time with fewer breaks of office workers was linked to longer durations of work.[24] Although the risk of occupation of office work has been found low in terms of chronic health problems, it may in real increase the risk of cardiometabolic and mortality problems due to accumulated sedentary life style and especially sustained sedentary time at working place.[25,26] Therefore, it is obvious that many office workers need to be physically active.

2. THEORETICAL FRAMEWORK and LITERATURE REVIEW

2.1. Musculoskeletal Disorders in Office Workers

Musculoskeletal disorders include different inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves and vascular structures. Thus, contain clinical syndromes such as tendon inflammations and related conditions (tenosynovitis), nerve compression problems (cubital tunnel syndrome, sciatica), and osteoarthrosis, low back pain and other regional pain syndromes. [27] Musculoskeletal disorders (MSDs) are a leading problems in almost all industries, from those containing heavy manual work to those with more sedentary activities.[28] Studies of office workers have related to these problems with many office work risk factors. Specific physical factors related to diseases; intensive, repetitive or constant tasks, strange, continuous or excessive positions of the body, inadequate recovery time, vibration and temperature differences. Examples of psychosocial factors seen in office work include; repetitive work, time pressure, high job demands, lack of support from colleagues and poor manager-employee relationship. [29]

Musculoskeletal symptoms are worldwide sorrounded by computer users with a high incidence of symptoms, specially in the neck and shoulder area, and the costs and effects on quality of life according to these symptoms are significant. Occupational computer usage has rising commonly over the last two decades. [30] High prevalence of musculoskeletal symptoms in upper extremities was related to increased computer usage. Repetitive stress factors often affect the habitual posture of office workers and cause musculoskeletal symptoms to occur. [31]

Office workers were commonly report musculoskeletal problems in their spine. Workers who are suffering from such symptoms were more likely to name their workstations insufficient. Office work is commonly related to long durations of sitting, which has been present to be a risk factor for neck pain. The risk of musculoskeletal injuries in the spine can be caused by prolonged sitting times, especially inadequate workstation ergonomics, as well as by prolonged static tension in the muscles; increased compression and load on ligaments and muscles in the intervertebral discs; decreased tissue mobility; differentiated spinal curvature and weakened paravertebral muscles may occur as a cause or consequence of possible musculoskeletal injuries. [31] Repeated movement of the upper extremities, constant incorrect posture of the fingers, local pressure increases at the wrist and forearm and wrist contact points have become possible pathomechanisms of the use of the keyboard and mouse. Non-neutral continuous postures, which may lead to further discomfort and injury, are related to the increase of the compressive forces in the nerves of the upper extremities and surrounding tissues. Sitting position compared with standing posture; Unsupported sitting position, back injury and discomfort mechanisms, increased erector spinae contraction levels are affected by muscle fatigue.[32]

2.2. Risk Factors in Office Ergonomics

The technology has increased with the computar usage in industries and as well as the productivity, reduced paper consumption and saving the planet, created new job possibilities, and differed the effort and necessities of existing jobs. Thus, less time is spent hand written documents with the increased use of computers and decreased use of paper and typewriters. More uninterrupted computer time has increased the incidence of computer-linked work related musculoskeletal disorders (WRMSDs) [33]

Since the early 1990s, studies about work-related musculoskeletal disorders attract attention and the researchers focused on the job organization which includes physical and psychosocial factors within the work environment. The job organization or work system includes of five important subsystems: organizational structure, people or personnel sub-division, technology or technological sub-divison, work duties, and the relevant external environment.[34] The duration of visual display units (VDU) work is in many studies, has been characterized as a risk factor for musculoskeletal discomfort of upper extremities. [6,14] A number of different psychosocial factors have been associated with risk factors for musculoskeletal symptoms in the neck / shoulder region, for example: high work effort, limited time, mental stress, salary dissatisfaction, high workload, and lack of support from colleagues and directors. [34] Changes in job technique while performing VDU work have been checked, in experimental studies as well as in field studies. It has been offered that office workes with a poor technique during VDU work, work with higher muscle tension in the forearm and shoulder and their wrists were more extended. [34] Exposure to occupational computer usage can be explained in different ways. In a lot of studies cumulative or average duration of computer usage or the usage of computer related tools like mouse and keyboard over a particular time period have showed.[35]

Environmental control is applied especially to the physical working station environment. It is important to know for the worker how to adjust the working station effectively. For the worker's health and productivity, control of the working environment can have positive effects. It also contributes directly to job satisfaction and performance, and also effects indirectly to office worker's distractions, privacy, stress, and communication. [36] Physical job demands, work-linked psychosocial factors, and individual differences were also have been identified as causal factors contributing to the formation of WRMSDs. [37] Physical work demands like effort, static awkward postures, and repetitive stress have been linked to underlying mechanisms leading to the development of WRMSDs. The National Institute for Occupational Health and Safety (NIOSH) has collected five psychosocial factors related to musculoskeletal disorders. These factors are; job satisfaction, intensified workload, repetitive work, job control and social support. The individual risk factors of office workers were defined as age, gender, culture, educational background, job satisfaction and personality type and were associated with the formation of WRMSDs. [38]

In office ergonomics, assessing individual factors is important. Office worker's individual risk factors contain physical, cognitive, cultural, personal, and psychosocial parts; it also includes perceptual and sensory systems which is different for every human being and can be explained as disabilities; biorhythms; communication; vocational training; work experience; health history; and occupational stress. Individual factors could contribute as a risk for developing the WRMSDs. [33] Long durations of sitting and static seated postures provoke being sedentary at VDU workplaces and are therefore discussed as risk factors for the musculoskeletal system. [39] In the office arrangement due to ergonomics, the effort, or the mechanical stress on the body, and posture can be linked to WRMSDs. The frequency and duration of efforts of the office workers can be related to work productivity and may contribute to WRMSDs. Pay incentives encouraging faster work may result in insufficient recovery time, leading to tissue damage and WRMDs. [21]

2.3. Postural Changes in Office Ergonomics

The body weight, the tension in the surrounding muscles and ligaments, intra-abdominal pressure and any external loads are acting as mechanical forces on the spine. In an upright standing position, the centre of gravity is located anterior to the spine and it creates a flexion moment on the spine. This flexion moment should be counteracted the paravertebral muscles for an extensor moment to maintain the upright position. The pelvis positioned vertically in standing position, while the L5/S1 vertebrae make an angle of approximately 30° above and below the horizontal respectively. When an office worker sits with an angle approximately 60-70° between the thighs and the trunk for a long period of time, the flexibility of the tissues decreases and as tension in the hamstring muscles restricts this movement of the hip joint. The limitation is the tendency to rotate the pelvis backward for the last 20-30 ° remaining, depending on individual flexibility levels as a result of hamstring tension. And the sacrum which is attached to the pelvis, is also rotated, as a result the natural curve of the lumbar spine is flattened. In another saying, in order to keep vertical position of the trunk there should be needed a balanced flexion of the lumbar spine. [40]

As many study presented that the development of musculo-skeletal disorders and discomfort are related to both poor postures and static working positions. In modern societies and bussiness life, seated working positions are seems like more the norm, but does not provide immunity from discomfort and musculo-skeletal problems. [41] The upper extremity muscles perform static contractions during computer duties, while the distal muscles, like hand and forearm contract and relax contiuously. These muscle contractions and sustained poor postures cause prolonged tension in muscle groups, which is leading to muscle strains. [33]

While work is performing, the elements of a working system interact together, such as the worker, equipment, environment, task, and organization. Shikdar et al. [42] found that screen glare, muscle fatigue, and poor posture were the most important factors contributing to ocular, general musculoskeletal, upper body, and physical symptoms. Yet again it is obvious that workstation designs were specially affecting the working posture, which is turning to habitual posture and it contributes to physical symptoms in a lot of different ways. [42]

When an office worker is sitting at a desk, she or he adopts flexible lumbar spine postures, which may result in increased contribution of passive tissues to the preservation of an upright body. If this flexed lumbar postures are continued for a period of time, the passive flexion stiffness of the lumbar spine can decrease, because of viscoelastic creep or stress-relaxation in the posterior lumbar tissues. This situation leads to increased intervertebral joint laxity and also attributed to fluid loss in the intervertebral discs. [43] The unsupported sitting provides the slumped posture in seated position and this is linked to increased spinal compression forces compared to standing, as well as results in deformation of the intervertebral discs, which are compressed in the front and splited at the back. [40] As mentioned above in fewlines, biomechanical studies have present that an incorrect seated posture could affect a posterior rotation of the pelvis, resulting in decreased sacral inclination and lumbar lordosis and increased forces at the discs. The risk factors vary by workplace and individual preferences and may influence the level of back muscles strain. [44]

The ‘‘forward head tilt’’ that is mostly adjusted physically as poor posture by office workers, which is formed with a combination of lower cervical flexion, upper cervical extension includes rounded shoulders which is consisted with scapular protraction and elevation. This is a common clinical situation that office workers presenting with neck and shoulder symptoms which is developing poor postures. [21] Clinical research studies presented that insufficient design or usage of furniture were causing shoulder and neck discomfort. The position of the heads should be in position with minimum stress is put on the neck muscles. The suggested viewing angle is 15°–30° for the neck and head. The position of a video display unit relative to eyes can influence the muscles, which is activated for the vision. Thus the visual strain can occur. The viewing space from the eyes to the screen, and the height of the screen to the eyes are the two main parameters of VDU position. [42] In addition, for a computer workstation lighting is an important visual environmental factor. Salvendy [45] mentioned about screen glare types and proper positioning of the screen, adding an anti-reflection filter and controlling the light source. Another environmental factor is noise and it can disrupt the ability to focus on the job and may increase stress factors. Salvendy provided some solutions to take care the noise problems in working environments. [42,45]

In office work the other risk factors in computer use are the keyboard and mouse. To maintain the ideal position of the wrist, the workers should minimize the environmental stress factors and to keep the wrist straight and free from extension or flexion and ulnar deviation. Salvendy [45] made recommendations for an ergonomic and comfortable usage of a keyboard and a mouse, so it should include stability, slope, force, wrist pad, surface, and space for mobility. [42,45]

2.4. Physical Activity Level of Office Workers

Pysical activity is an integral part of a healty lifestyle and has been linked to many heath benefits.[46] Muscle activity is necessary for performing physical activity at work, during sports, leisure time, etc. and it mostly reflected to be health promoting, because for ensuring the viability of the musculoskeletal tissues, the mechanical loading is essential. However, muscle activity is also playing an important role in the improvement of musculoskeletal problems. This is plausible for tasks with high force demands, probably causing biomechanical overloading on the tissues, thus obviously linked to disorders such as sports injuries and occupational accidents. [47]

Sedentary lifestyles in job demands are prevalent and are consists of long periods in sitting posture. Lack of physical activity and long hours in sitting positions may lead to muscle weakness and tension in the upper segments of the body, which predisposes to continuous stress injury when job demands are repetitive or requires higher loads. A physcially active lifestyle may help to reduce these stress factors and maintain strong muscles against repetitive strain injury. It is widespread addmitted that physical active lifestyle has countless health benefits and is related to decreased risks of coronary heart disease, stroke, high blood pressure, cancer, and many other illnesse; however, it is not known thet the risk factors of work-related repetitive strain injury decreases with leisure-time physical active lifestyle. [48] Musculoskeletal discomfort in the back, neck and extremities are common health complaints, with high socioeconomic consequences in terms of health expenditures and lost working days. The aetiology of musculoskeletal disorder symptoms are multifactorial. In addition to several physical, psychosocial and environmental risk factors both at work and during leisure, being physically active provides beneficial for health. Particular muscle training as well as aerobic physical exercise have presented health benefits on neck pain and low back pain [49]

Recent international guidelines including the World Health Organization guidelines, suggest 150 minutes per week of moderate to vigorous PA (MVPA) in general. In literature reviews, they presented that 150 minutes per week of moderate to vigorous PA has an important role on health benefits to decrease the risks for various chronic diseases and premature mortality. It is important to highlight that physical activity, as a behaviour and health-linked physical fitness, as a state of mind are conversely related to chronic conditions and mortality. Nevertheless, health-related physical fitness is generally related to decrease the risk factors. [50]

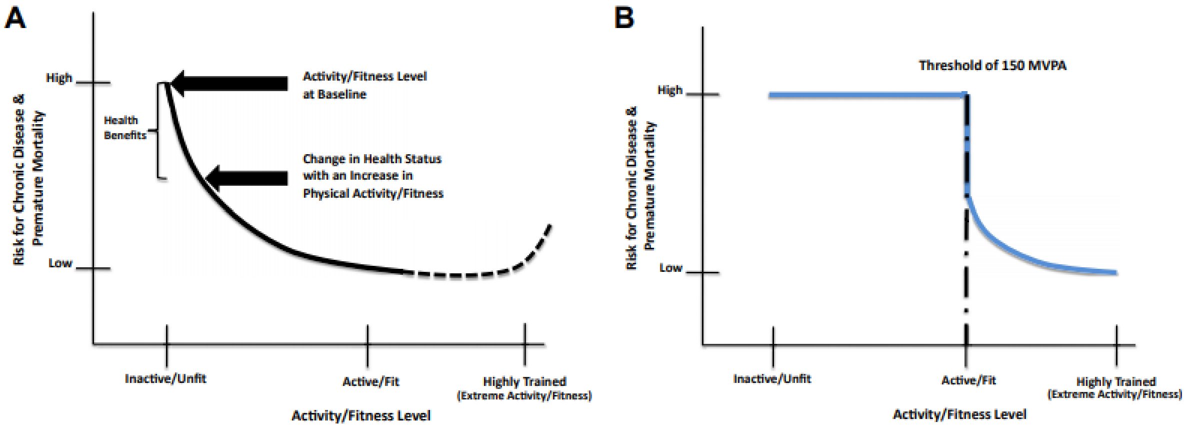

Figure 2.1. Theoretical activation-response relationship between physical activity and health status. [51]

In figure 2.1., A presents that in physically inactive / unfit individuals, a small change in physical activity / fitness will lead to a significant improvement in health status, including a reduction in the risk of chronic disease and the risk of premature death. The dashed line represents the state of health seen in highly trained endurance athletes. In B, the present message of physical activity indicates that an evidence-based activation response curve (blue line) would be beneficial for health by clearly accepting 150 minutes of moderate to vigorous physical activity as the threshold. Thus, the relationship would be “L-” or “S” shaped. However, the irresistable evidence shows that this not the case. (A) [50,51] In public health, physical activity level is done from the perspective of doing too little or not complying to suggestions in general. In occupational studies, the observation of physical activity is generally as performing too much or doing harmful activities. A study suggested that instead of the dichotomy, physical activity was thought as a continuum and explained the connection between the level of activity and low back pain as a U- shaped curve; for example too little pyhsical activity as well as too much physical activity are harmful for spinal health. [51]

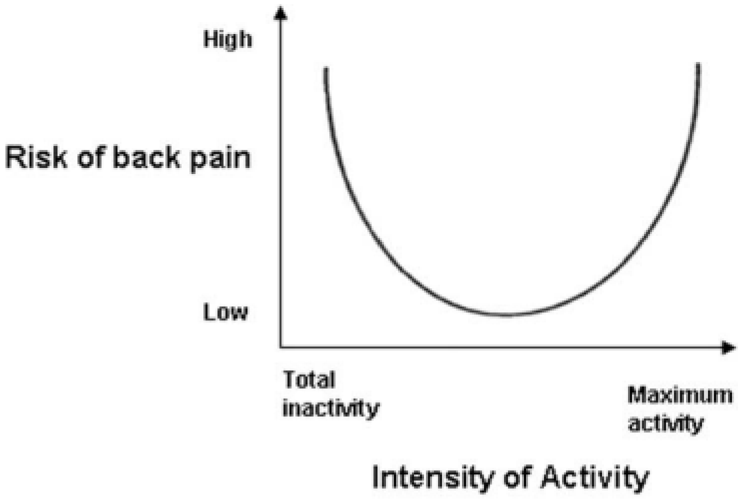

Figure 2.2. Theoretical relation between physical activity and back pain. [51]

Sedentary lifestle is a risk factor which can be modified, for cardiovascular diseases and another chronic diseases, like diabetes mellitus, cancer, obesity, hypertension, bone and joint diseases for example osteoporosis and osteoarthritis, and depression. [52] Whether physical activity has also a lot of benefits for office workers with musculoskeletal disorders is less clear, considering the risk of activity-linked injuries, a lot ofresearchers find a link between physical activities and a lower risk of musculoskeletal disorders feasible. If the stimulation of physical activities among office workes were efffective, could be preventing these problems and decreasing the related high costs. [53]

2.5. Workload According to Gender Difference

The relationship between work and health is differing for both women and men in developed economies. Nowadays, the nature of work and life styles are changing and most women are in paid employment. These social changes in gender are affecting both women’s and men’s lives, and as well as lifestyles to different ways. These changes put into possible new risk factors that could affect women’s health status. Nevertheless, gender inequality in some health findings may narrow as women's labor participation approaches men's. However, both women and men may have different kind of job experiences and its effects the family life, in particular when they become parents. The gender discrimination of the occupational force and the persistent gender imbalance in workload sharing of household put into that working women’s exposure to risk factors from both work tasks at jobs and household duties could differ widely from working men’s. This the exposure of work conditions and therefore the risk factors is effecting them daily and chronic. Therefore, musculoskeletal disorders may reflect the accumulation of exposure differences, both at work and at home, to investigate the relationship between work-related factors, domestic burden, and underlying biological differences. For explaining the prevalence of these musculoskeletal disorders in women compared to men, there is a model which presents the difference in exposure levels inbetween women and men at work and at home. This model is called; the work and family demand model. An alternative explanation is that women may be more likely to develope musculoskeletal disorders due to gender related biological risk factors such as hormones or physiology, because the meaning of work and family demands are different, or because women have less resources to cope with these necessities. In a study, this situation named this as the vulnerability model and of course, both models may be involved to the explanations. [54]

For many musculoskeletal disorders, being a female is mostly described as a ‘‘risk factor’’, because the prevalence of being under these risk factors are common among general population and women when compared to men in large groups of employees have been presented to be twice as high. The relations of musculoskeletal disorders with gender and occupational ergonomic exposures should be assessed separately even women are in increased risk when exposed to the same ergonomic stress factors as men. [55]

This gender differences seems to be separated for neck region and upper segments problems than for back complaints. The prevalences of neck and upper-extremity complaints has been found to be consistently higher for women than for men, while the prevalence of low back complaints has been shown to be markedly higher for women or slightly higher for women and also slightly higher for men. Several descriptions have been made for the gender difference in prevalence. First, it has been explained that women and men have different exposure to the office ergonomic risk factors, either because of differences in exposures outside work or because of differences in work exposure due to the gender discrimination in the industry. This last factor has been suggested to be the most important explanation for the sex difference in the prevalence of musculoskeletal complaints. However, the difference in prevalence remains when women and men from the same occupational level, or with the same work duties are compared. Second, it is mentioned that women are more likely to define discomfort and express pain and symptoms, either because of lower threshold for detecting pain and symptoms or cause they are more likely to express emotional stresses than men, who are taught not to complain in general. The third explanation referred is that, the same risk factors may have a different effect on both women and men. At this respect, it has been pointed out that the joint laxity seems to be affected by sex hormones, women therefore being more vulnerable for musculoskeletal pain. In addition, women, on the average, have smaller body dimensions, lower muscle force, and a lower aerobic capacity. Thus tasks performed with similar exposure loads in most cases, and that results with a higher relative workload for women, which could lead to more complaints. Consequently, women and men have been found to use different coping strategies for dealing with occupational stress factors, and this difference could change outcomes [56]

Therefore, even if women and men have the same work and equal workloads, women are exposed to a greater workload in total with increased physiological burdens, not only during paid work but also at home after work, including evenings and weekends. This has been demonstrated in a recent study when female managers in an insurance company compared psychophysiological stress responses during and after the study to their male counterparts who matched their professional position and age. There was no significant difference between men and women in the job data, but when home norepinephrine levels were compared; males quickly returned to normal levels, while females had significantly higher norepinephrine levels. It was found that the increased stress levels of women after work were dependent on the presence of children at home, while the stress level of men was not related to the presence of children at home. For the development of WRUEDs among women, the extra workload of household could be an important risk factor. [57]

3. METHOD & MATERIAL

3.1. Individuals

This study is designed as a comparative cross-sectional study. The study population was 67 women and 51 men, in total 118 participants. All participants were office workers in same building and same firm, which was a big insurance company, consisting of different departments, like finance, law and information technologies. This study was peformed between January 20th and May 10th of 2019 in Istanbul. An application was made to the Yeditepe University Clinical Reseach Ethical Committee for this study and approval was obtained from the Ethical Committee. (App.1) The study was conducted according to the Helsinki Declaration. All of the participants joined voluntarily to the study and signed the informed consent form. (App. 3)

Inclusion criteria	• Being inbetween 18-60 years of age • Maintain office work for at least a year or more • Should perform their functions in a sitting posture • To work with office tools like computer (monitor, keyboard and mouse), telephone and documents
Exclusion criteria	• Being Pregnant • Having a disability, which leads postural changes like brachial plexus

Figure 3.1. Inclusion / Exclusion Criteria

3.2. Method

3.2.1. Evaluation

The participants were evaluated with questionnaires, which includes questiones about their sociodemographic features, musculoskelal discomfort, physical activity level, postural changes and work related risk factors. All of the questionnaires were done at paticiants working station, except the New York Posture Rating Chart (NYPRC). It was done in the emergency room of the company. Sociodemographic features were searched with a form, which was prepared by the reseacher. It includes name-surname, age, gender, marital status, having children, height, weight, daily routines and etc. MSD was evaluated with a gold standart survey titled with Cornell Musculoskelatal Discomfort Questionnaire (CMDQ). Pysical activity level was questioned with International Physical Activity Questionnaire (IPAQ-Short Form). Postural changes were examined with New York Posture Rating Chart (NYPRC). Work-related risk factors for MSD were observed by the researcher through the Rapid Office Strain Assessment (ROSA).

3.2.1.1. Sociodemographic Feature of Participants

The sociodemographic questionnaire (App. 4) included name, age, weight, height, any chronic diseases or previous surgeries, medical family history, prescripted medicine and also asked questions to understand the daily routine of the participant, likewise how often does participant exercise or does she/he have any active pain in their musckuloskeletal system. It also comprised leisure time activities and how much time spending the participant for these activities, and the work in house and the time spend for it. At last the number of the household and the workload sharing of the participant in percentage was also taken by the researcher.

3.2.1.2. Cornell Musculoskelatal Discomfort Questionnaire (CMDQ)

Musculoskeletal discomfort [58] is going to be evaluated with a gold standart survey called Cornell Musculoskelatal Discomfort Questionnaire (CMDQ). The questionnaire adapted in Turkish and its Turkish versions was validated by Erdinç et al. [59] The female and male version of the CMDQ for workers in turkish language is presented in App. 5. The Turkish version was used in this study.

CMDQ was used to collect data for determining participants musculoskeletal disorders. It has three subdivisions; disorder frequency, severity of disorder and working ability interference effects and there ia a body map diagram, CMDQ assesses the presence of the musculoskeletal disorders of 12 body redions (totally 20 regions of the body) last 7 days of work. This questionnaire contains four divisions and designed for both female and male subjects assessing both in standing positions and sedentary duties.

The CMDQ was used to assess:

1. Frequency of pain episodes during the last work week at: neck; shoulder; elbow; arm; wrist; hands and fingers,

2. The intensity of pain expressed as level of discomfort and

3. The ability to work

The symptoms were considered during the week before assessment. The scores were analyzed for each person for the whole body, right hand and left hand separately as follows. For frequency the rating was: Never = 0, 1–2 times/week = 1.5, 3–4 times/week = 3.5, Every day = 5, and Several times every day = 10. The level of discomfort scores were analyzed as: Slightly = 1, Moderately uncomfortable = 2, and Very uncomfortable = 3. The Interference scores were rated as: Not at all = 1, Slightly interfered = 2, and Substantially interfered = 3. [59] The total discomfort score was calculated by using the following formula: frequency of th MSD × discomfort level × interference level = total discomfort score. [60]

3.2.1.3. International Physical Activity Questionnaire (IPAQ-Short Form)

International Physical Activity Questionnaire (IPAQ-Short Form) [61] was used for understanding the pysical activity level of the participants. IPAQ short form is a tool which was designed to determine the physical activity level among adults, which are in the age range of 15-69 years, [62] IPAQ has been suggested as a cost-effective method to evaluate physical activity level based on a gold standard. The Turkish version of the IPAQ – Short Form, which is validated by Saglam, M. Et al. (2010) [63], was used for office workers is presented in App. 6.

The short form records the activity of four intensity levels: [64]

1) vigorous-intensity activity such as aerobics

2) moderate-intensity activity such as leisure cycling

3) walking

4) sitting

MET values selected to determine the level of physical activity were obtained during the IPAQ reliability study conducted in 2000-2001 [61]. In this study, an average MET value for gait was created by including all gait types. The same procedure was performed for moderate-intensity physical activities and vigorous-intensity physical activities. The values generated for the analysis of IPAQ data are defined as follows.

- Walking MET-minutes/week = 3.3 × walking minutes × walking days
- Moderate MET-minutes/week = 4.0 × moderate-intensity activity minutes × moderate days
- Vigorous MET-minutes/week = 8.0 × vigorous-intensity activity minutes × vigorous-intensity days
- Total physical activity MET-minutes/week = sum of Walking + Moderate + Vigorous MET- minutes/week scores. [61]

Category 1: Low

The low physical activity level.

Category 2: Moderate

Due to following criteria classified as moderate. Individuals who is matching at least one of the below criteria classified as 'moderate'.

a) Vigorous-intensity physical activity lasting at least 20 minutes per day for 3 or more days

b) Moderate-intensity physical activity and/or walking of at least 30 minutes per day for 5 or more days

c) Any combination of gait, moderate or vigorous physical activities providing a minimum total physical activity of at least 600 MET-minutes per week for 5 or more days per week [61]

Category 3: Vigorous

Due to following criteria classified as high. Individuals who is matching at least one of the below criteria classified as 'high'.

a) Vigorous-intensity physical activity achieving a minimum total physical activity of at least 1500 MET-minutes/week for at least 3 days

b) Any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 3000 MET-minutes/week for 7 or more days [61]

Sitting Question in IPAQ Short Form

IPAQ sitting assessment is an additional indicator of the time spent on sedentary activity and is not included as part of the total score of physical activity. The sedentary behaviours are not presenting as categorical levels. [61]

3.2.1.4. New York Posture Rating Chart (NYPRC)

Postural assessment was examined with New York Posture Rating Chart (NYPRC) [65] in erect posture at the emergency room of the company. The participants took off their thick clothing and they were evaluated with their T-shirts on, but for elimination of researcher's misleading, the participants also palpated the area which is observed by. The Turkish version of the NYPRC was used for office workers is presented in App. 7. [66]

The NYPRC applies a quantitative approach to evaluate the alignment of various body blocks for an individual in the anatomical position. The NYPRC evaluates overall postural alignment and includes drawings indicating 3 different levels for each of the 13 body alignment sections. The 13 body alignment segments include posterior views of the head, shoulders, spine, hip, feet, and arches, and lateral (left side) views of the neck, chest, shoulders, upper back, trunk, abdomen, and lower back. This 13 body alignment section includes; head, shoulders, spine, hips, feet and arches of feet from posterior view and neck, chest, shoulders, upper back, trunk, abdomen and lower from lateral views. (App. 7) In this original version, each body segment was scored with 3 different scores; 5 as ideal posture, 3 as slight deviation of the body, or 1 as pronounced deviation. [67] The participant is positioned with his back to the observer standing at 10 feet and the relevant visuals are marked by the observer. Then, the second half of the evaluations is started and the participant turns the lateral side to the observer, the relevant images are marked. A plumb line positioned very close to the participant between the participant and the researcher represents the vertical reference line in the pictures and assists the observer in assessing the relative position of the body parts. [67]

The scores of the remaining 13 body alignment segments are summed, allowing a range of overall score between 13 and 65, with a score of 65 representing ideal posture. In this study the total scores divided in two separated ways. First in three parts; upper part, trunk and lower part. Upper part was determined as A + B + G + H + I + J, trunk part as C + D + K + L + M and lower part as E + F in the chart. The second score is divided into 2 subdivisions; posterior and lateral views. The intra-group correlation coefficient of NYPA is reported to be moderate (0.70) and the inter-practitioner correlation coefficient is low (0.57). [68] Therefore, it is reported that it is a practical assessment method, if used by the same evaluator for repeated evaluations, it is more reliable.

Total Score	Classification
>= 45	Very good
40-44	Good
30-39	Tolarable
20-29	Weak
<= 19	Severe

Figure 3.2. Scoring of the New York Posture Scale [66]

3.2.1.5. Rapid Office Strain Assessment (ROSA)

Work-related risk factors for MSD is going to be observed and evaluated with turkish version of Rapid Office Strain Assessment(ROSA) which is developed by Sonne et al. [32]. This method was validated in turkish by Özkan and Kahya [69] (App. 8). Participants were observed at the volunteer's working station in the regular sitting position of the office worker.

ROSA is a tool which was developed to assess office workstations for risk factors linked to the onset of musculoskeletal discomfort level. To determine and score risk factors, risk factors are grouped into the following categories: chair, monitor, phone, mouse and keyboard. Each group of risk factors is affected by a separate time score indicating exposure to each component of the desk work. [1,27] This assessment provides information on identifying the specific characteristics of office work, harmonizing office furniture and office workers, and optimizing the ergonomic design of desk work. [32], it is used to quickly measure risk factors related to desk office work and to determine the level of risk in the workplace and to know the working postures that workers set in the workplace. [27,69]

This scoring begins with a short interview with office workers to observe workplaces and understand job descriptions. This scoring method was applied by using pen, paper and scoring checklist as one-to-one between the observer and the participant at each employee's own desk. The scoring process starts with the sum of the scoring of the lower part of the chair, where the scores from the chair height and seat pan depth section are combined to form the vertical axis in the section A scoring table. (Figure 3.3.) The total scores from the backrest and armrests sections are combined to form the horizontal axis of the section A scoring chart. These two points intersect the cell and the score of chair is calculated. To reach the total value of the saction A score, the time value (-1, 0 or 1) is added to the chair total score. The score obtained from the monitor part (plus monitor duration value) is taken as a value on the horizontal axis and the score from the telephone part (plus telephone duration value) is taken as the value on the vertical axis. The intersecting score of the monitor and telephone sections constitutes the total score of section B. Section C (Figure 3.4.) is a product of the score of the keyboard (plus duration value) on the horizontal axis and the score of the mouse (plus duration value) on the vertical axis. The the total value of Section B and section C is found from the intersection cell. This score is then used to determine the ROSA total score as a horizontal axis for the monitor and peripheral Score (Figure 3.5). Section A score forms the vertical axis of the ROSA final scoreboard. To determine the ROSA total score, the intersection of the total score of the monitor and peripherals on the horizontal axis and the total score of the chair on the vertical axis determine the risk score between 1 and 10. (10 represents the highest possible risk) [32]

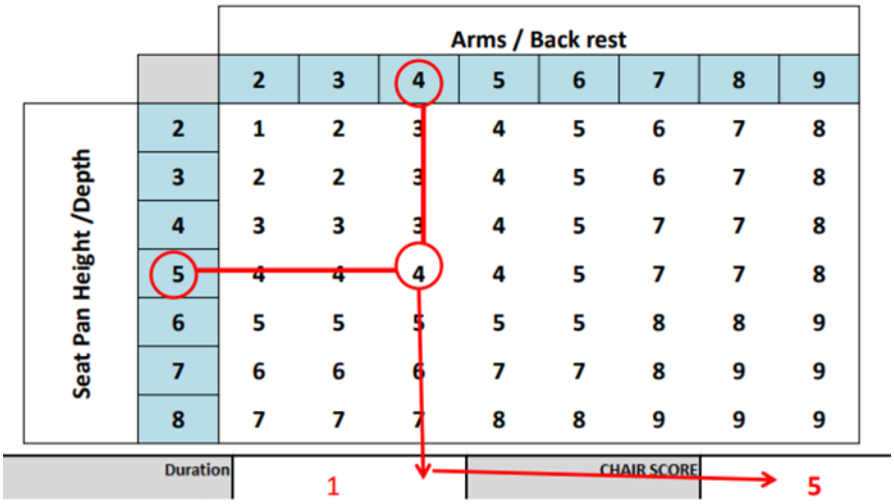

Figure 3.3. Section A Scoring Chart [32]

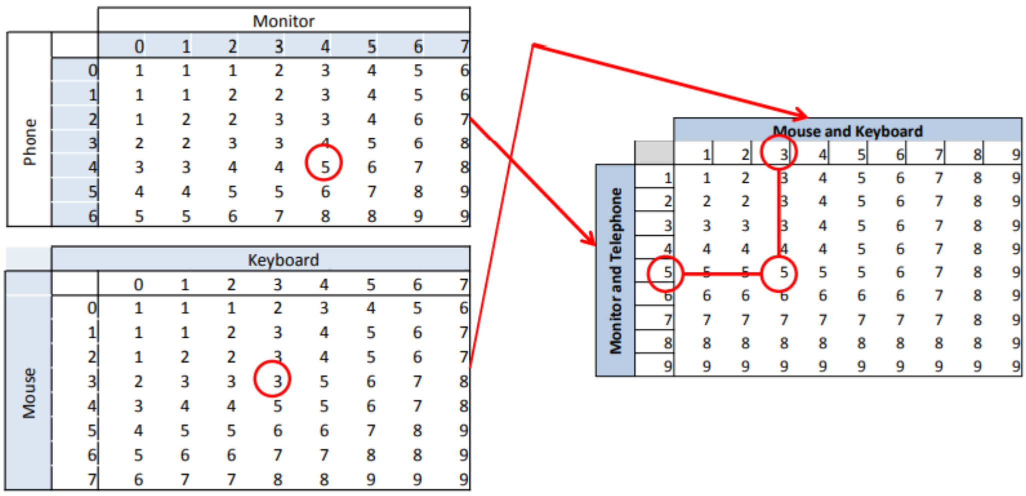

Figure 3.4. Section B, Section C and Monitor and Peripherals Scoring Chart[32]

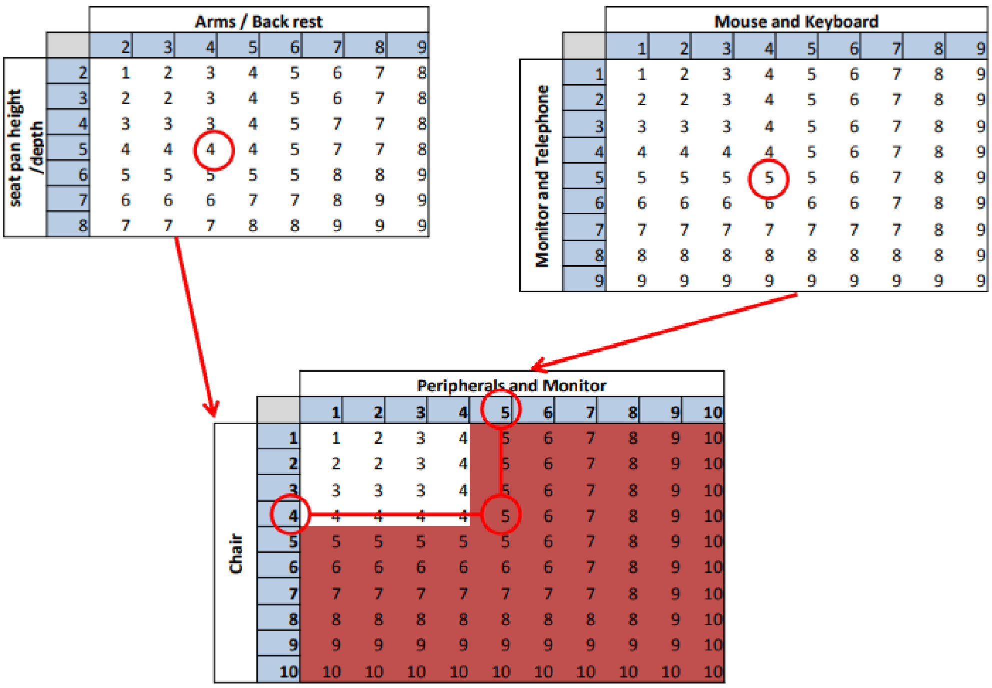

Figure 3.5. ROSA Final Score Chart [32]

The duration scores of monitor and peripherals has a different calculation. If a worker uses equipment for more than 1 hour or more than 4 hours per day, +1 is added as ROSA's duration point. If the office worker uses equipment for about 30 minutes to 1 hour or 1 to 4 hours per day, the duration score of ROSA is given zero and no additions are made. In case of continuous operation of less than 30 minutes or a total of 1 hour of work per day, the duration score shall be -1 points. [32] A total ROSA score of 1-10 is obtained from the total values obtained from peripherals and chair scoring; 1 indicates the minimum risk level within the office and 10 indicates the maximum risk level. [1]

3.3. Interventions & Suggestions

The outcomes of the assessment was compared with each other according to gender. The verbal suggestions were given to improve the awareness of the participants in relation to ergonomic risk factors. The chair and peripherals’ adjustments were done after the assessment of ergonomic risk factors. The modifications for daily life activites explained to the participants, whom had musculoskeletal discomfort in their lives and they were guided to exercise regulary to restore the musculoskeletal strength.

4. ISTATISTICAL ANALYZE

We used ‘Statistical Package Analyze for Social Sciences’ (SPSS) version 21.0 for the statistical analyses in our study. The error margin of the study was taken as $\alpha = 0.05$, $1-\beta = 0.20$, and the Z value was taken as 1.96 for the table value corresponding to 95% confidence level. The d value of the sample was determined as 0.18. [70] As a result of power analysis of the study, the sample size was determined as 118 persons.

The statistical data was expressed as mean ± standard deviation ($\bar{x} \pm SD$) and percentages (%) in both gender for normally distributed variables. For quantitative variables, the number (n) and percentage (%) were calculated. Nonparametric tests were used when parametric conditions could not be achieved.

Shapiro-Wilk test was used to evaluate the normal distribution of musculoskeletal disorders among genders. Since the value is $p < 0.05$, there is no normal distribution and nonparametric test was used. Mann-Whitney U test was used to detemine the significance to calculate within-group changes in both gender regarding to the musculoskeletal disorders of the participants.

For the comparison of gender and having musculoskeletal disorders or not was calculated with Chi- Square Test. Spearman Correlation test was used to compare the descriptive data between the groups regarding to their postural changes, the level of physical activity and the features of their work environment. Musculoskeletal disordes in both men and women according to office risk factors was evaluated with Mann-Whitney U test. Postural changes among musculoskeletal disordes was evaluated with Mann- Whitney U test and the long duration of sitting, assessed with IPAQ- Sitting, was evaluted with Independent-t test. Physical activity and MSD in between genders was calculated with Chi-Square test. And the physical activity level variety and the office risk factors for MSD datas was calculated with Fisher’Exact test. The level of significance was set as $p \leq 0,05$.

5. RESULT

The study population consisted of 118 volunteer participants, 67 women (56,8%) in the mean age of 34,2 ± 6,89 (min-max=22-50) and 51 men (43,2%) in the mean age of 34,2 ± 6,42 (min-max=18-50). Women's height average was found 162,67 ± 6,56 cm and weight average was found 59,75 ± 9,14 kg. The BMI (body mass index) was 22,67 ± 3,79 kg/m^2. The occupation year of female office workers were 10,5 ± 6,70 years. On the other side men's height average was found 179,57 ± 6,1 cm and weight average was found 82,47 ± 11,63 kg. The BMI (body mass index) was 25,57 ± 3,32 kg/m^2. The occupation year of male office workers were 9,66 ± 6,2 years. Age and occupation year variables were distributed normally, but height, weight, BMI and sitting duration were not normally distributed. After statistical analysis it was found that, there was no homogeneity in between groups. (Table 4.1.)

Table 4.1. The Mean Values of Sociodemographic Features of The Office Workers

	Women (N=67, 56,8%)		Men (N = 51, 43,2%)		t / z	p
	X ± SD	MIN-MAX	X ± SD	MIN-MAX		
Age (years)	34,2 ± 6,89	22 – 50	34,2 ± 6,42	18-50	-,002 [a]	,999
Height (cm)	162,67 ± 6,56	150 – 178	179,57 ± 6,1	160 – 190	-14,316 [a]	,000*
Weight (kg)	59,75 ± 9,14	45 – 90	82,47 ± 11,63	52 – 115	-7.981[b]	,000*
Body Mass Index (kg/m$^{2)}$	22,67 ± 3,79	16,49 – 34,29	25,57 ± 3,32	15,65 – 32,28	-4,324[b]	,000*
Occupation Year	10,5 ± 6,70	1 - 27	9,66 ± 6,2	1 – 25	-,476[b]	,634
Sitting Duration MET/min/week	5688,13 ± 865,13	4050 - 7740	6193,24 ± 1119	4050 - 9720	-2,776[a]	,007*

a: Independent T Test

b: Mann Withney U Test

According to Table 4.2., 16,4% (n=11) of the female participants had chronic illness and 83,6% (n=56) had no chronic illness, on the other hand 13,7% (n=7) of the male participants had chronic illness and 86,3% (n=44) had no chronic illness. 19,4% (N=13)of the female participants had previous surgery and 80,6% (n=54) had no previous surgery, however 25,5% (n=13) of the male participants had previous surgery and 74,5% (n=38) had no previous surgery. 73,1% (n=49) of the female participants had chronic diseases in their family history and 26,9% (n=18) had no chronic diseases in their family history, only 54,9% (n=28) of the male participants had chronic diseases in their family history and 45,1% (n=23) had no chronic diseases in their family history. 9% (n=6) of the female participants had regular drug usage and 91% (n= 61) had no regular drug usage, but 5,9% (n=3) of the male participants had regular drug usage and 94,1% (n=48) had no regular drug usage.

Table 4.2. Sociodemographic Features of The Participants

		Women(N=67)		Men (N=51)	
		N	%	N	%
Chronic Illness	Yes	11	16,4%	7	13,7%
	No	56	83,6%	44	86,3%
Previous Surgery	Yes	13	19,4 %	13	25,5%
	No	54	80,6%	38	74,5%
Family History	Yes	49	73,1%	28	54,9%
	No	18	26,9%	23	45,1%
Regular Drug Usage	Yes	6	9%	3	5,9%
	No	61	91%	48	94,1%

The distribution of the study population according to MSDs was calculated with the Chi-Square Test (Table 4.3.). There was no statistical significance, but we can say that women (43,3%) are more likely to having MSDs than men (41,2%). In total, 42,4% (n=50) of the population was having MSDs and 57,6% (n=68) was not having MSDs.

Table 4.3. Musculoskeletal Disorders versus Gender Variables in Frequencies

	Women (N=67)	Men (N=51)	TOTAL
Musculoskeletal Disorders Existance	N = 29 43,3%	N = 21 41,2%	N = 50 42,4%
Musculoskeletal Disorders Absence	N = 38 56,7%	N = 30 58,8%	N = 68 57,6%
TOTAL	N= 67 56,8%	N = 51 43,2%	N = 118 100%
p	,853[c]		

c: Chi - Square Test

According to table 4.4., there was no significant correlation in groups between long sitting hours and having MSDs. There was positive ranking between age and weight and BMI values in women. There was negative correlation between having MSDs and age in women. And there was also negative correlation between occupation year and long sitting hours in women. On the other side there was negavitve ranking in between long sitting hours and age and also in between long sitting hours and occupation year in man. And there was positive correlation in between long sitting hours and weight. There was no correlation between occupation year and having MSDs, long sitting hours and having MSDs and also in BMI and weight to occupation year and long sitting hours in women. On the contrary, in men there was positive correlation between long sitting hours and weight. There was negative correlation in between age and long sitting hours in men. As in women, there was negative correlation in between occupation year and long sitting hours also in men.

Table 4.4. Correlation between Long Sitting Hour and Having MSDs & Sociodemographic Features in Women & Men

		Age	Occupation Year	Long Sitting Hours
WOMEN	Having MSDs	r=-,331** p=,006	-	-
	Long Sitting Hours	-	r=-,286* p=,019	-
	Weight	r=,320** p=,008	-	-
	Body Mass Index	r=,357** p=,003	-	-
MEN	Long Sitting Hours	r=-,445** p=,001	r=-,328* p=,019	-
	Weight	-	-	r=,288* p=,040
Total	Having MSDs	-	r=-,187* p=,043	-

*p<0,05; ** p< 0,01

In table 4.5., the values of physical activity level were shown in between groups. The physical activity level of women were 893,53 ± 1011,33 MET-min/week (min-max=0-6156) and men were 1090,22 ± 1237,03 MET-min/week (min-max=0-6480). As women and men compared, there was no significant result inbetween according to Mann Whitney U Test. However in this study, PAL was compared due to MSDs according to gender and still no statistical significance was found. But, in both women and men, descriptive values of PAL levels were higher in MSDs absence than MSDs existance. It showed that participants were physically more active, when they had no musculoskeletal problems. In both group, they were moderate active according to IPAQ – Short Form evaluation.

Table 4.5. The Values of Physical Activity Level (PAL) in between Groups

Physical Activity Level in MET-min/week		X ± SD	MIN-MAX	z	p
Women (N=67)		893,53 ± 1011,33	0 – 6156	-,967[b]	,333
Men(N=51)		1090,22 ±1237,03	0 - 6480		
MSD +	Women - PAL (N=29)	757,36 ± 858,79	0 – 4200	-,521[b]	,602
	Men-PAL (N=21)	873,53 ± 810,64	0 – 2598		
MSD –	Women-PAL (N=38)	997,45 ± 1113,86	0 – 6150	-,643[b]	,521
	Man-PAL (N=30)	1241,9 ± 1458,55	0 – 6480		

b: Mann Whitney U Test
MSD: Musculoskeletal Disorder; (+ Existance; - Absence)
PAL: Pyhsical Activity Level

In Table 4.6., the NYPRC values were shown according to gender. As women and men compared, total NYPRC scores in average were 56,43 ± 5,04 in women and 56,80 ± 4,38 in men. And there was no significance in between gender. The results were not changing also in MSD existence or absence. There was no significance in between women and men due to MSD. But in the NYPRC's trunk region was significant regardless of MSD according to gender. When the values of MSD existence were looked, trunk and lower part regions were significant. On the contary when the values o MSD absence were looked, both of the variables were not significant. When the outcomes interpreted, it can be said that both women and men were in ideal posture in total.

Table 4.6. The Values of Posture in Between Groups

New York Posture Rating Chart		Women (N=67)		Men (N=51)		t / z	p
		X ± SD	MIN - MAX	X ± SD	MIN - MAX		
Total		56,43 ± 5,04	47- 65	56,80 ± 4,38	45 - 65	-2,246[b]	,805
Trunk		20,93 ± 3,20	15 - 29	23,03 ± 3,20	15 -29	-2,762[b]	,006*
MSD +	Total	56,79 ± 4,9	47 – 65	57,09 ± 3,97	49 – 65	-,423[a]	,674
	Upper part	25,93 ± 3,52	18 - 30	24,57 ± 2,91	20 - 30	-1,631[b]	,103
	Trunk	21,28 ± 3,61	15 - 29	23 ± 2,1	19 - 25	-2,162[b]	,031*
	Lower part	9,93 ± 0,37	8 - 10	9,52 ± 0,87	8 - 10	-2,165[b]	,030*
MSD -	Total	56,16 ± 5,2	47 – 65	56,60 ± 4,7	45 – 65	-.363[a]	,718
	Upper part	25 ± 3,88	18 - 30	23,93 ± 3,84	18 - 30	-,909[b]	,363
	Trunk	22,05 ± 2,86	15 - 29	23,06 ± 2,13	17 - 25	-1,747[b]	,081
	Lower part	9,37 ± 0,94	8 - 10	9,6 ± 0,81	8- 10	-1,067[b]	,286

a: Independent T-test
b: Mann Whitney U test
MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

As women and men were compared (Table 4.7.) , ROSA scores were not significant. When the values were interpreted, it can be said that none of the participants were effected by office ergonomic risk factors. There was significance in MSD absence in ROSA peripherals component between women and men. But as MSD existance and absence were compared according to gender, it was seen that the average values of all component were higher in MSD existance than MSD absence. But there were no significant results. When the outcomes interpreted, it can be said that both women and men were not in risk according to office ergonomics evaluation.

Table 4.7. The Values of ROSA in Women & Men According to MSD

Rapid Office Strain Assessment		Women (N=67)		Men (N=51)		z	p
		X ± SD	MIN-MAX	X ± SD	MIN-MAX		
Section A Chair		3,95 ± 0,73	2 - 6	3,73 ± 0,78	2 – 5	-1,580[b]	,114
Section B+C Peripherals		2,22 ± 0,46	2 - 4	2,35 ± 0,6	2 - 5	-1,282[b]	,200
Total		3,99 ± 0,69	3 - 6	3,80 ± 0,75	2 - 5	-1,242[b]	,214
MSD +	Section A Chair	4,07 ± 0,65	3-6	3,86 ± 0,79	3-5	-1,019[b]	,308
	Section B+C Peripherals	2,34 ± 0,48	2-3	2,24 ± 0,44	2-3	-,805[b]	,421
	Total	4,07 ± 0,65	3-6	3,86 ± 0,79	3-5	-1,019[b]	,308
MSD –	Section A Chair	3,87 ±0,77	2-6	3,63 ± 0,76	2-5	-1,129[b]	,259
	Section B+C Peripherals	2,13 ± 0,41	2-4	2,43 ± 0,68	2-5	-2,502[b]	,012*
	Total	3,92 ± 0,71	3-6	3,77 ± 0,73	2-5	-,704[b]	,482

b: Mann Whitney U test

MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

In table 4.8 the workload sharing of household (%) and the duration of house work (h) were compared according to gender. Both of them were statistically significant inbetween women and men according to Mann Whitney U test. The workload sharing of household in women were 50,03 ± 30,11% (min-max=0-100) and in men were 30,25 ± 20,8% (min-max=0-100). The duration of house work in women were 1,37 ± 1,17 h (min-max=0-5) and in men were 0,90 ± 0,70 h (min-max=0-3). When the gorup was compared according to MSD, the results were different. In MSD existance the duration of housework was significant and in MSD absence the workload sharing of house hold was significant. When the outcomes interpreted, it can be said that women were spent more effort and time to take care of household than men, but the difference was significant only in the duration of housework according to having MDSs.

Table 4.8. The Difference in between the workload sharing of household and the duration of house work between Women & Man

		Women (N=67)		Men (N=51)		z	p
		X ± SD	MIN-MAX	X ± SD	MIN-MAX		
Workload Sharing of Household (%)		50,03 ± 30,11	0 - 100	30,25 ± 20,8	0 – 100	-3,301[b]	,001*
Duration of House Work (hour)		1,37 ± 1,17	0 - 5	0,90 ± 0,70	0 - 3	-2,184[b]	,029*
MSD +	Workload Sharing of Household (%)	50,39 ± 30,27	0 – 100	30,79 ± 30,42	0 – 100	-1,803[b]	,071
	Duration of House Work (hour)	1,59 ± 1,24	0-5	0,95 ± 0,67	0-3	-1,974[b]	,048*
MSD -	Workload Sharing of Household (%)	40,75 ± 20,99	0 – 100	20,87 ± 20,24	0-100	-2,726[b]	,006*

	Duration of House Work (hour)	1,21 ± 1,1	0 – 4	0,87 ± 0,73	0 – 3	-1,186[b]	,236

b: Mann Whitney U test
WSH : Workload Sharing of Household
DHW: Duration of Housework
MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

Comparison of physical activity level variety according to gender due to MSD were shown in table 4.9. When the outcomes in between women and men were compared with or without including MSD existance or absence, there were no significance among PAL variety. When the outcomes interpreted, it can be said that both in women and men were likely to be inactive due to MSD existance and were likely to be moderate active, when there was no MSD, however the difference were not significant in both.

Table 4.9. The Difference in Physical Activity Level due to Gender in order to MSD

		INACTIVE; <600 MET-min/week	x^2 / p	MODERATE; >600–3000 MET-min/week	x^2 / p	ACTIVE; <3000 MET-min/week	x^2 / p	x^2 / p
Total	Women	N = 31 (56,4%)	,891 ,345[c]	N = 34 (57,6%)	1,371 ,241[c]	N = 2 (50%)	,000 1,000[c]	,000 1,000[d]
	Men	N = 24 (43,6%)		N = 25 (42,4%)		N = 2 (50%)		
MSD +	Women	N = 16 (55,2%)	1,385 ,239[c]	N = 12 (41,4%)	,043 ,835[c]	N = 1 (0,6%)	–	1,143 ,751[d]
	Men	N = 10 (47,6%)		N = 11 (52,4%)		N = 0		
	Total	N = 26 (52%)	×	N = 23 (46%)	×	N = 1 (2%)	×	1,262 ,582[d]

MSD -	Women	N = 15 (39,5%)	,034 ,853[c]	N = 23 (57,9%)	1,778 ,182[c]	N = 1 (2,6%)	,333 ,564[c]	1,310 ,540[d]
	Men	N = 14 (46,7%)		N = 14 (46,7%)		N = 2 (6,7%)		
	Total	N = 29 (42,6%)	×	N = 37 (52,9%)	×	N = 3 (4,4%)	×	1,262 ,582[d]

c: Chi-Square Test
d: Fisher's Exact Test
MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

In table 4.10., it was shown the correlation in postural changes according to workload sharing of household, duration of house work and sitting duration on MSDs in women & men. In women with MSD the duration of house work and upper part region of NYPRC was correlated with nagative ranking, the MET-min/week value while sitting was correlated positive ranking. However, in women without having MSD both workload sharing of household and duration of house work were correlated with negative ranking. In men the only correlation in between workload sharing of household and lower part region of NYPRC was positive ranking in MSD existance. When the outcomes interpreted, it can be said that women with MSD's postural upper part region were effected negative as the time spent for the house work increasing, but the situation was same in women without MSD, also in workload sharing of household. While the sitting duration were increasing in women with MSD, the upper part values of NYPRC were still inceasing in this study.

Table 4.10. The Correlation in Postural Changes according to Workload Sharing of Household, Duration of House Work and Sitting duration on MSDs in Women & Men

		NYPRC	Workload Sharing of Household	Duration of House Work	Sitting duration; MET/ min/week
Women	MSD +	Upper part	-	r=-,384* p=,040	r=,567** p=,001
		Trunk	-	-	-

		Lower part	-	-	-
	MSD -	Upper part	r=-,341* p=,036	r=-,412* p=,010	-
		Trunk	-	-	-
		Lower part	-	-	-
Men	MSD +	Upper part	-	-	-
		Trunk	-	-	-
		Lower part	r=,506* p=,019	-	-
	MSD -	Upper part	-	-	-
		Trunk	-	-	-
		Lower part	-	-	-

*p<0,05; ** p< 0,01

MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

The correlation according to workload sharing of household and number of family member on ROSA in women and men were shown in table 4.11. In women there was no correlation, but in men there was a correlation with negative ranking in between workload sharing of household and the number of family member. When the outcomes interpreted, the workload sharing of household and the number of family member and ROSA had no effect on each other in this study.

Table 4.11. The Correlation according to Workload Sharing of Household and Number of Family Member on ROSA in Women & Men

		Workload Sharing of Household (%)	Number of Family Member
Women	ROSA Total		
	Workload Sharing of Household (%)		
Men	ROSA Total		
	Workload Sharing of Household (%)		r=-,627** p=,000

WSH: Workload Sharing of Household
NFM: Number of Family Member
*p<0,05; ** p< 0,01

According to table 4.12., there was just one significant correlation in women among postural changes and ROSA, with or without MSDs. Trunk region of NYPRC and periherals component of ROSA was correlated with negative ranking in women with MSD. In men with MSD, there was no correlation, on the other hand men without MSD there were significant correlation with positive ranking between lower part of NYPRC and chair component of ROSA and upper part of NYPRC and peripherals of ROSA. There was also a correlation with negative ranking between lower part of NYPRC and peripherals of ROSA. When the outcomes interpreted, it can be said that as the trunk values of NYPRC in women with MSD increases, the impact of peripheral risk factors decreases, or the exact opposite. On the other hand as the upper part values of NYPRC in men without MSD increases, the impact of peripheral risk factors decreases.

Table 4.12. The Correlation in Postural Changes according to ROSA Scores on MSDs in Women & Men

		ROSA / NYPRC	Section A Chair	Section B+C Peripherals	Total
Women	MSD +	Upper part	-	-	-
		Trunk	-	r=-,416* p=,025	-
		Lower part	-	-	-
	MSD -	Upper part	-	-	-
		Trunk	-	-	-
		Lower part	-	-	-
Men	MSD +	Upper part	-	-	-
		Trunk	-	-	-
		Lower part	-	-	-
	MSD -	Upper part	-	r=,409* p=,025	-
		Trunk	-	-	-
		Lower part	r=,437* p=,016	r=-,514** p=,004	-

*p<0,05; ** p< 0,01

MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

After the comparion due to gender with or without MSD, the correlation between physical activity level, postural changes and office ergonomic risk factors and MSD existance (Table 4.13) and absence (Table 4.14) were questioned. In MSD existance, physical activity level was correlated with positive ranking to total, trunk and posterior components of NYPRC, as shown in the table 4.13. ROSA peripheral component was correlated with negative ranking to upper part component of the NYPRC. For MSD existance, it can be said that as the PAL increases, postural scores increases as well. And with the decreasing risk of peripherals had a statistically related to upper part component of NYPRC. On the other hand, in MSD absence physical activity level was correlated with negative ranking to ROSA periherals value. (Table 4.14.) The total score of NYPRC was correlated with positive ranking to ROSA peripheral component. As physical activity level icreases, the risk of office ergonomics were decreasing according to table 4.14. As the total score of NYPRC increases, ROSA peripheral scores were decreasing in this study.

Table 4.13. The Correlation between the MSD Causation Parameters and MSD Existance

	PAL	Sitting duration; MET-min/week	ROSA Section A Chair	ROSA Sec. B +C Peripherals	ROSA TOTAL
NYPRC Total	r=,315* p=,026	-	-	-	-
NYPRC Upper Part	-	-	-	r=-,376** p=,007	-
NYPRC Trunk	r=,333* p=,018	-	-	-	-
NYPRC Lower Part	-	-	-		-
NYPRC Posterior	r=,329* p=,020	-	-	-	-
NYPRC Lateral	-	-	-	-	-

*p<0,05; ** p< 0,01
MSD: Musculoskeletal Disorder; (+ Existance; - Absence)
PAL: Physical Activity Level
NYPRC: New York Posture Rating Chart
ROSA: Rapid Office Strain Assessment

Table 4.14. The Correlation between the MSD Causation Parameters and MSD Absence

	Sitting duration; MET- min/week	ROSA Section A Chair	ROSA Sec. B +C Peripherals	ROSA TOTAL
PAL	-	-	-	r=-,327** p=,006
NYPRC Total	-	-	r=,253* p=,037	-
NYPRC Upper Part	-	-	-	-
NYPRC Trunk	-	-	-	-
NYPRC Lower Part	-	-	-	-
NYPRC Posterior	-	-	-	-
NYPRC Lateral	-	-	-	-

*p<0,05; ** p< 0,01

MSD: Musculoskeletal Disorder; (+ Existance; - Absence)

PAL: Physical Activity Level

NYPRC: New York Posture Rating Chart

ROSA: Rapid Office Strain Assessment

Table 4.15. The Correlation between The Musculoskeletal Disorders'Causation Parameters

	NYPRC Trunk	NYPRC Upper Part	NYPRC Total	PAL	Sitting Duration	Workload Sharing of Household	Occupation year	BMI	Weight	Height	Age
Gender (Women / Men)	r=,255** p=,005				r=,243** p=,008	r=-,305** p=,001		r=,400** p=,000	r=,738** p=,000	r=,801** p=,000	
MSD + / -							r=-,187* p=,043				r=-,198* p=,031
Duration of House Work		r=-,218* p=,018	r=-,200* p=,030	r=-,238** p=,010	r=-,242** p=,008	r=,579** p=,000	r=,248** p=,007			r=-,242** p=,008	
Sitting Duration						r=-,228* p=,013	r=-,282** p=,002		r=,187* p=,042	r=,260** p=,005	r=-,259** p=,005
NYPRC Total				r=,197* p=,033							
NYPRC Trunk				r=,218* p=,018						r=,267** p=,004	
ROSA Chair										r=-,211* p=,022	
ROSA Peripherals		r=,231* p=,012		r=-,254** p=,005				r=,197* p=,032	r=,200* p=,030		r=,236* p=,010
ROSA Total				r=-,199* p=,031						r=-,193* p=,036	

*p<0,05; ** p< 0,01

6. DISCUSSION and CONCLUSION

Office work comprising extensive computer usage has been referred to be a risk factor for musculoskeletal disorders, and this concern has been reinforced by many other studies. [69-72] Recent literature reported about MSDs in office workers and its causations, they were lack of physical activity and having weak antigravity muscles, bad postural habits while seated and being exposed to ergomonic risk factors.[71] However according to our knowledge, the studies comparing these parameters according to gender are limited. [72] Thus, we aimed to determine the correlations between the risk factors of office work, physical activity level and postural changes and to compare their outcomes according to gender. Since it is important to notice early signs of MSD, especially in overuse traumas, which is occuring due to sedentary lifestyle and repetitive stress. Therefore, the awareness about importance of enough physical activity, obtaining the ideal posture and avoiding the ergonomic risk factors must be provided and implemented in corporate life.

Leblebici [73] mentioned that in current years, the workplace conditions and the comfort of the employees determined by the environment in the workplace have been accepted as an important factor in evaluating the productivity of office workers. With the increasing use of computers in the workplace, the number of people and businesses that adjust ergonomic designs for office and plant installations is increasing. Ergonomics, also called biomechanics in work, has become popular because of expectations of office workers for more individual comfort. [71] In modern countries women and men are working in similar conditions, also mostly in developing countries; but the workload sharing at home was not equal between women and man in general. Our study showed workload of women consist of higher percentages than men, even they were spending equal time at their working place. Overall, this situation makes women anxious and stressed.[57] In our study since we did not search the mental status of the participants, but we can relate this outcome to the household demands as a stress factor which was achieved from the sociodemographic questionnaire, the results of women were higher than men. Strazdins and Bammer [54] metioned in their study that proportionally more women reported at least one symptom and women also reported more severe symptoms than men. We also compare our outcomes according to have MSDs, women were more likely to improve MSDs than men. This may also be one of the reason of increased stress factors from household demands in women paticipants. We may conclude that this may be searched in relation to the household demands and duration of house work.

Parry and Straker [23] found that office work is characterised by sustained sedentary time and contributes significantly to overall sedentary exposure of office workers. Our study presents that the study population were mostly consisted of physically inactive or moderate active participants. They were not performing enough exercises to protect their body from repetitive stress factors. According to our findings there is a correlation between physical activity and total posture score, as well as trunk region of posture. In relation to these outcomes, the participants who were more active than the others were having higher postural scores than the others. In addition, there is a significant negative correlation between physical activity and office ergonomic risk factors. It means that increased physical activity has a relation to lower risk scores. Thus, although their physical activity level were low or moderate, since the study environment were well adjusted regarding to the occupational health and safety standards, the participants were not under risk according to the total scores of office risk factors.

Occupational studies were having significant findings between bad posture and long durations of sitting. [40-44] Our findings were not includes any significant correlation between low postural scores and long sitting durations. According our outcomes, there is a significant result between women and men due to sitting duration, women were sitting less than men in a week, but this situation did not effect posture status of both gender. However, Vos et al. [74] remarked that females and males may be exposed to different types of loading patterns during long sitting periods and may experience different pain-producing ways. According to our findings there was statistical significance between women and man due to trunk scores (in favor to men) and lower part scores (in favor to women) of posture scores in musculoskeletal disorder existance. Business management has an important role for computer user office workers. As another perspective we can manage the design of the workstation, if office workers have to work in a static seated posture for a long duration of time, the workstation can contribute to performance, comfort, and health problems. [34,36,42] Salvendy [45] offered that computer users should stop working for at least 15 minutes after 2 hours of continuous computer work. They found that at least some improvement in musculoskeletal system due to office ergonomics may be due to these breaks. Shikdar [42] indicated in a study that serious ergonomic deficiencies in office computer workstation design, layout, and usage. In our study we did not find any significant result between long durations of sitting and the components of office ergonomic risk factors and the subdivisions of the postural assessment, but we did not question the breaks of the participants.

When comparing the office ergonomic risk ractor outcomes according to gender, we did not find any significant results. Wahlstrom et al. [75] described that concerning computer work in particular, sex linked differences have been maintained, as an example, in the usage of a computer mouse. Women work under relatively more musculoskeletal load by applying more force to the mouse and using more range of motion than men. However in our study, we did not find any significance between women and men due to peripheral usage, but when comparing women and men without musculoskeletal disorders, there were significant finding between peripheral component of office ergonomic risk factors and gender. In the light of these outcomes, women were applying higher efforts than men according to musculoskeletal disorders.

The power of this study was in the confidence level of 0,95%. Ghanbary and Habibi [70] determined the sampling error 0.20 for their study, for determining our study population we used 0.18 to increase the strength of our study. The study population was first calculated as 90 participants, however after the calculation with 0.18, the total number of participants was 118 (67 women, 51 men), which is the strength of our study. We may point out that our major limitations were involvement of only in one company, without a control group and non-homogenues distribution within the group. As a study to observe the effects of office ergonomics on participants who are working in sitting position for long durations, we only observe the physical effects and did not search the mental status of the participants. As a contribution the combination of both physical and mental status may be searched for future studies. However, to our knowledge we have not found any study in the literature searching the relations according to gender between different conditions; office ergonomic risk factors, posture and physical activity level due to MSD absence or existence. This may be considered as orginality and strength of our study. We may conclude that the feedback of the office workers were positive and they knew about office ergonomics in theory however, they were not aware of the precautions such as, how can they adjust the chair and the peripherals to themselves. Therefore, this study may increase the awareness of the participants and may help them to protect themselves from the hazardous effect of repetitive stressors.

In conclusion there were no significant differences between gender in relation to risk factors of their office ergonomics. However, there is a significant result against women when comparing women and men without having any musculoskeletal disorders according to peripheral component of office ergonomics risk factors. Regarding their postural status only trunk region of the posture assessment was significant in the favor of men. In addition when comparing the physical activity results, there were no significant results between women and men, however the physical activity level of the men participants were higher than women. When comparing the duration of house work and the workload sharing of household, there was a significant difference between gender. Women were more likely to do house work than men.

Consequently, according to our results no significant differences was found between women and men in terms of musculoskeletal disorders. However, there was a negative correlation between height and risk factors of office ergonomics. In addition, between total physical activity values and risk factors of office ergonomics a negative correlation was found. There was a positive correlation between the upper part scores of posture evaluation and peripheral component of risk factors. New york posture total values were positively correlated with physical activity, while a negative correlation was found between the duration of house work. Physical activity scores were negatively correlated with the duration of house work; and a positive correlation was found with the trunk score of the posture.

Overall, we aimed to search the gender differences in relation to musculoskelatal disorders of the participant office workers. In conclusion, we did not find a significance result that musculoskeletal disorders were differing among gender. However, the impact of the parameters on musculoskeletal disorders; physical activity level, postural changes and the office ergonomics risk factors could not be undeniable according to correlation tables. Our hypothesis was women were dealing with stress factors at work as well as at home more than men. Therefore, women were effected easily from office ergonomic risk factors more then men, but there were no significant outcomes between gender according to office ergonomic risk factors, however women were affected in many ways and were open to have musculoskeletal disorders, as they were working in same conditions.

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8. DATA FILES

Appendix 8.1.

Ethical Approval

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15- 1650 **28/03/2019**
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

İlgili Makama (Ayşe Alparman)

Bahçeşehir Üniversitesi Sağlık Bilimleri Fakültesi Fizyoterapi ve Rehabilitasyon Bölümü Prof. Dr. H. Serap İnal'ın sorumlu olduğu **"Ofis Çalışanlarında Kas-İskelet Sistemi Yaralanma Nedenlerinin Cinsiyete Göre Karşılaştırılması: Çalışma Ortamı, Postür ve Fiziksel Aktivite Düzeyi"** isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası (**1618** kayıt Numaralı KAEK Başvuru Dosyası), Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından **27.03.2019** tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (**KAEK Karar No: 1002**).

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

Yeditepe Üniversitesi 26 Ağustos Yerleşimi, İnönü Mahallesi Kayışdağı Caddesi 34755 Ataşehir / İstanbul
T. 0216 578 00 00 www.yeditepe.edu.tr F. 0216 578 02 99

Appendix 8.2.

Sigorta Şirketi İzin Belgesi

15.01.2019

YEDİTEPE ÜNİVERSİTESİ
KLİNİK ARAŞTIRMALAR ETİK KURUL BAŞKANLIĞI'NA,

Yeditepe Üniversitesi Sağlık Bilimler Enstitüsü'nde 20143034017 nolu yüksek lisans öğrencisi olan Ayşe Alparman'ın "Ofis Çalışanlarında Kas-İskelet Sistemi Yaralanma Nedenlerinin Cinsiyete Göre Karşılaştırılması: Çalışma Ortamı, Postür Ve Fiziksel Aktivite Düzeyi" isimli tez çalışmasının benim kontrolümde ofis binasında yürütülmesine 6698 Nolu Kişisel Verilerin Korunması Kanununa uygun bir şekilde gönüllü katılımcıların haklarının korunması ve kişisel bilgilerinin hiç bir koşulda paylaşılmaması koşuluyla izin ve onay veriyorum.

Bilginizi ve gereğini saygılarımla arz ederim.

İşyeri Hekimi

Meltem BÜYÜKLİMANLI

Dr. Meltem BÜYÜKLİMANLI
İşyeri Hekimi
Dip.Tes. No: 62632

Şirket İçi / Internal

Appendix 8.3.

Bilgilendirilmiş Onam Formu

Bu çalışma Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Bölümü yüksek lisans öğrencisi Ayşe ALPARMAN'ın mezuniyet projesi olarak tasarlanmıştır.

Araştırmanın başlığı: ''Ofis Çalışanlarında Kas-İskelet Sistemi Yaralanmalarının Nedenlerinin Cinsiyete Göre Karşılaştırılması: Çalışma Ortamı, Postür ve Fiziksel Aktivite Düzeyi'' Araştırmanın amacı, Bu çalışmada masa başı çalışan bireylerin olası kas iskelet sistemi problemlerinin nedenlerini belirlemek ve bu sorunların cinsiyetler arasında bir fark oluşturup oluşturmadığı kantitatif veriler ile saptamaktır.

Kişisel bilgileriniz herhangi bir amaçla, kurum yöneticileri veya üçüncü kişilerle kesinlikle paylaşılmayacaktır. Araştırmada izlenilecek yöntem: Soru-cevap ve klinik değerlendirmeler ile ofis çalışanlarının, kas-iskelet sistemlerinde ağrının değerlendirilmesi, bireylerin aktivite düzeylerinin ve posturel değişikliklerin kantitatif verilerile analizi sağlanacak ve değerlendirilecektir. Ofis ortam şartları değerlendirilecek ve kas iskelet sistemi hastalıklarının altında yatan nedenler değerlendilirken, cinsiyetler arasında bir farklılık olup olmadığı araştırılacaktır. Bu değerlendirmeler yaklaşık yarım saat olarak planlanmıştır.

Araştırmada yapılan değerlendirmelerin sonuçları yalnızca araştırma kapsamındaki çalışmalarda kullanılacaktır.

Katılımınız için teşekkür ederiz.

Sorumlu Araştırmacı ve Danışman Öğretim Üyesi Prof. Dr. Fzt. H. Serap İNAL

Yardımcı Araştırmacı Fzt. Ayşe ALPARMAN, B.Sc.

Araştırma Süresince 24 Saat Ulaşılabilecek Kişi Adı / Soyadı / Telefonu: Prof.Dr. Serap İNAL- +90 212 381 9182 Fzt. Ayşe ALPARMAN- 05333864614

Allianz Tower Ataşehir bünyesinde *‘’Ofis Çalışanlarında Kas-İskelet Sistemi Yaralanmalarının Nedenlerinin Cinsiyete Göre Karşılaştırılması: Çalışma Ortamı, Postür ve Fiziksel Aktivite Düzeyi”* adlı çalışmaya hiçbir baskı ve zorlama olmaksızın kendi rızamla katılmayı kabul ediyorum. Gönüllünün Adı-Soyadı : Tarih: İmzası : Açıklamaları Yapan Kişinin Adı-Soyadı: Tarih: İmzası:

Appendix 8.4.

Sosyodemografik Özellikler

1. AD-SOYAD:
2. YAŞ:
3. BOY:
4. KİLO:
5. CİNSİYET : KADIN ……. ERKEK
6. MESLEK/YILI :
7. KRONİK HASTALIK, GEÇİRİLMİŞ CERRAHİ:

8. İLAÇ KULLANIMI:

9. AİLE ÖYKÜSÜ:

10. Egzersiz sıklığı: Yapıyorum :…. Ayda-Haftada…………..kadar
Yapmıyorum :….

Egzersiz süresi: ( )20 dk az ( )20-30 dk ( )30 – 60 dk ( )60 dk. dan fazla

11. AĞRI: DİNLENME POZİSYONU 1-10:
HAREKETLE 1-10:

12. Boş vakit aktiviteleri / ayrılan süre:

13. Ev işleri / ayrılan süre:

14. Evdeki kişi sayısı ve iş bölümleri:

Appendix 8.5.

Cornell Musculoskeletal Discomfort Questionnaire

Aşağıdaki resim, ankette sorulan vücut bölümlerini yaklaşık olarak göstermektedir.
Lütfen uygun kutucuğu işaretleyerek cevaplayınız.

		Geçtiğimiz hafta çalıştığınız süre boyunca, vücudunuzda ne sıklıkta ağrı, sızı, rahatsızlık hissettiniz? (Her vücut bölümü için cevaplayınız)					Eğer ağrı,sızı,rahatsızlık hissettiyseniz, ne kadar şiddetliydi?			Eğer ağrı,sızı,rahatsızlık hissettiyseniz, bu işinizi yapmanıza engel oldu mu?		
		Hiç hissetmedim	Hafta boyunca 1-2 kez hissettim	Hafta boyunca 3-4 kez hissettim	Her gün bir kez hissettim	Her gün bir çok kez hissettim	Hafif şiddetliydi	Orta şiddetliydi	Çok şiddetliydi	Hiç engel olmadı	Biraz engel oldu	Çok engel oldu
Boyun		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Omuz	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sırt		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Üst Kol (omuz - dirsek arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bel		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ön Kol (dirsek - bilek arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
El Bileği	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kalça		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Üst Bacak (kalça - diz arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Diz	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Alt Bacak (diz - ayak arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ayak	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(b) Female version of the T-CMDQ for standing workers

Aşağıdaki resim, ankette sorulan vücut bölümlerini yaklaşık olarak göstermektedir.
Lütfen uygun kutucuğu işaretleyerek cevaplayınız.

		Geçtiğimiz hafta çalıştığınız süre boyunca, vücudunuzda ne sıklıkta ağrı, sızı, rahatsızlık hissettiniz? (Her vücut bölümü için cevaplayınız)					Eğer ağrı,sızı,rahatsızlık hissettiyseniz, ne kadar şiddetliydi?			Eğer ağrı,sızı,rahatsızlık hissettiyseniz, bu işinizi yapmanıza engel oldu mu?		
		Hiç hissetmedim	Hafta boyunca 1-2 kez hissettim	Hafta boyunca 3-4 kez hissettim	Her gün bir kez hissettim	Her gün bir çok kez hissettim	Hafif şiddetliydi	Orta şiddetliydi	Çok şiddetliydi	Hiç engel olmadı	Biraz engel oldu	Çok engel oldu
Boyun		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Omuz	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sırt		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Üst Kol (omuz - dirsek arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bel		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ön Kol (dirsek - bilek arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
El Bileği	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kalça		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Üst Bacak (kalça - diz arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Diz	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Alt Bacak (diz - ayak arası)	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ayak	(Sağ)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Sol)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(a) Male version of the T-CMDQ for standing workers

Appendix 8.6.

Uluslararası Fiziksel Aktivite Anketi (Kısa Form)

İnsanların günlük hayatlarının bir parçası olarak yaptıkları fiziksel aktivite tiplerini bulmayla ilgileniyoruz. Sorular son 7 gün içerisinde fiziksel olarak harcanan zamanla ilgili olarak sorulacaktır. Lütfen yaptığınız aktiviteleri düşünün; işte, evde, bir yerden bir yere giderken, boş zamanlarınızda yaptığınız spor, egzersiz veya eğlence aktiviteleri.

Son 7 günde yaptığınız şiddetli aktiviteleri düşünün. Şiddetli fiziksel aktiviteler zor fiziksel efor yapıldığını ve nefes almanın normalden çok daha fazla olduğu aktiviteleri ifade eder. Sadece herhangi bir zamanda en az 10 dakika yaptığınız bu aktiviteleri düşünün.

1. Geçen 7 gün içerisinde kaç gün ağır kaldırma, kazma, aerobik, basketbol, futbol veya hızlı bisiklet çevirme gibi şiddetli fiziksel aktivitelerden yaptınız?

Haftada___gün

□ Şiddetli fiziksel aktivite yapmadım. → (3.soruya gidin.)

2. Bu günlerin birinde şiddetli fiziksel aktivite yaparak genellikle ne kadar zaman harcadınız?

Günde ___ saat

Günde ___ dakika

□ Bilmiyorum/Emin değilim

Geçen 7 günde yaptığınız orta dereceli fiziksel aktiviteleri düşünün. Orta dereceli aktivite orta derece fiziksel güç gerektiren ve normalden biraz sık nefes almaya neden olan aktivitelerdir. Yalnız bir seferde en az 10 dakika boyunca yaptığınız fiziksel aktiviteleri düşünün.

3. Geçen 7 gün içerisinde kaç gün hafif yük taşıma, normal hızda bisiklet çevirme, halk oyunları, dans, bowling veya çiftler tenis oyunu gibi orta dereceli fiziksel aktivitelerden yaptınız?Yürüme hariç.

Haftada___gün

□ Orta dereceli fiziksel aktivite yapmadım. → (5.soruya gidin.)

4. Bu günlerin birinde orta dereceli fiziksel aktivite yaparak genellikle ne kadar zaman harcadınız?

Günde ___ saat

Günde ___ dakika

□ Bilmiyorum/Emin değilim

Geçen 7 günde yürüyerek geçirdiğiniz zamanı düşünün. Bu işyerinde, evde, bir yerden bir yere ulaşım amacıyla veya sadece dinlenme, spor, egzersiz veya hobi amacıyla yaptığınız yürüyüş olabilir.

5. Geçen 7 gün içerisinde, bir seferde en az 10 dakika yürüdüğünüz gün sayısı kaçtır?

Haftada___gün

□ Yürümedim. → (7.soruya gidin.)

6. Bu günlerden birinde yürüyerek genellikle ne kadar zaman geçirdiniz?

Günde ___ saat

Günde ___ dakika

□ Bilmiyorum/Emin değilim

Son soru, geçen 7 günde hafta içinde oturarak geçirdiğiniz zamanlarla ilgilidir. İşte, evde, çalışırken ya da dinlenirken geçirdiğiniz zamanlar dahildir. Bu masanızda, arkadaşınızı ziyaret ederken, okurken, otururken veya yatarak televizyon seyrettiğinizde oturarak geçirdiğiniz zamanları kapsamaktadır.

7. Geçen 7 gün içerisinde,günde oturarak ne kadar zaman harcadınız?

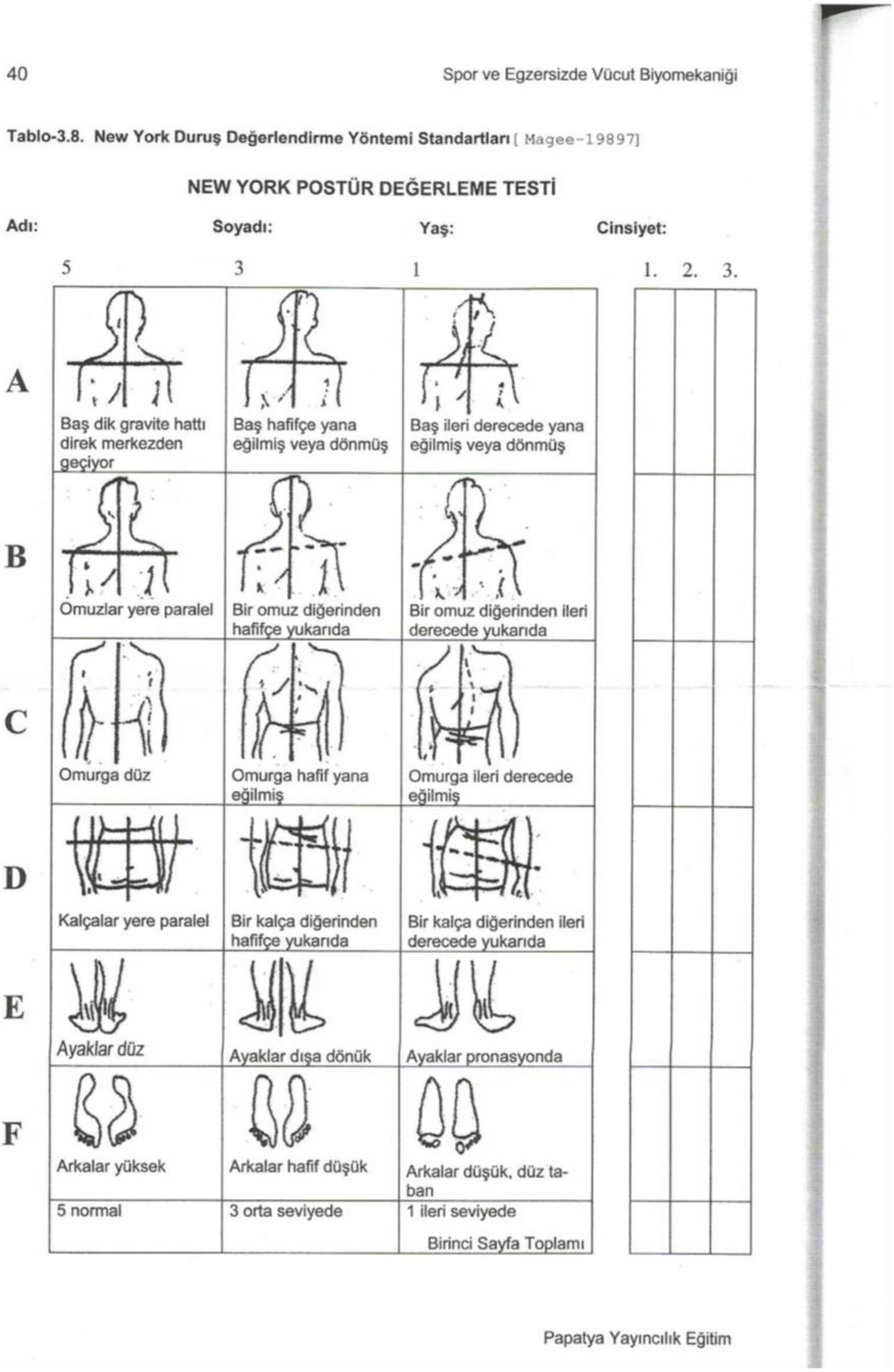
Günde ___ saat

Günde ___ dakika

□ Bilmiyorum/Emin değilim

Appendix 8.7.

New York Postür Değerlendirme Formu



Tablo-3.8. New York Duruş Değerlendirme Yöntemi Standartları [Magee-19897]

NEW YORK POSTÜR DEĞERLEME TESTİ

Adı: **Soyadı:** **Yaş:** **Cinsiyet:**

	5	3	1	1.	2.	3.
A	Baş dik gravite hattı direk merkezden geçiyor	Baş hafifçe yana eğilmiş veya dönmüş	Baş ileri derecede yana eğilmiş veya dönmüş			
B	Omuzlar yere paralel	Bir omuz diğerinden hafifçe yukarıda	Bir omuz diğerinden ileri derecede yukarıda			
C	Omurga düz	Omurga hafif yana eğilmiş	Omurga ileri derecede eğilmiş			
D	Kalçalar yere paralel	Bir kalça diğerinden hafifçe yukarıda	Bir kalça diğerinden ileri derecede yukarıda			
E	Ayaklar düz	Ayaklar dışa dönük	Ayaklar pronasyonda			
F	Arkalar yüksek	Arkalar hafif düşük	Arkalar düşük, düz taban			
	5 normal	3 orta seviyede	1 ileri seviyede Birinci Sayfa Toplamı			

Birinci Sayfa Toplamı

				1	2	3
G	Boyun dik çene içeride, baş omuz üstünde dengede	Boyun hafif önde çene hafif dışarıda	Boyun ileri derecede önde çene ileri derecede dışarıda			
H	Göğüs yukarıda sternum vücut önünde ileride	Göğüs hafif derecede çökmüş	Göğüs ileri derecede çökmüş (düz)			
I	Omuzlar merkezde	Omuzlar hafif ileride	Omuzlar protrakte			
J	Üst sırt normal	Üst sırt hafif yuvarlak	Üst sırt ileri derecede yuvarlak			
K	Gövde dik	Gövde hafif geriye açılı	Gövde geriye ileri derece açılanmış			
L	Karın düz	Karın protrake	Karın protrake ve sarkmış			
M	Alt sırt normal	Alt sırt hafif çukur	Alt sırt ileri derecede çukur			
	5 normal	3 orta seviyede	1 ileri seviyede TOPLAM SKOR			

1. Eğer sol kolondaki açıklamaya uygun ise 5 puan
2. Eğer orta kolondaki açıklamaya uygun ise 3 puan
3. Eğer sağ kolondaki açıklamaya uygun ise 1 puan

Appendix 8.8.

Rapid Office Strain Assessment

Sandalye Yüksekliği

Dizler 90º açıda (1)	Çok Alçak-Diz açısı<90º (2)	Çok Yüksek-Diz açısı>90º (2)	Ayaklar yere temas etmiyor (3)	Masa altında alan yetersiz-Bacak bacak üstüne atılamıyor (+1)	Ayarlanabilir Değil (+1)

Oturma Yüzeyi Derinliği

Oturma yüzeyi kenarı ile diz arası mesafe yaklaşık 3 inç (7,62 cm) (1)	Oturma yüzeyi kenarı ile diz arası mesafe < 3 inç (2)	Oturma yüzeyi kenarı ile diz arası mesafe > 3 inç (2)	Ayarlanabilir Değil (+1)

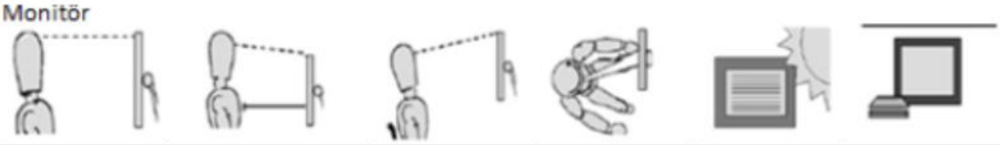
Kolçaklar

Dirsekler omuzlarla aynı eksende desteklenmiş, omuzlar rahat (1)	Kolçaklar çok yüksek veya düşük. Omuzlar rahat değil ya da kolçak bulunmuyor (2)	Kolçak yüzeyi sert veya hasarlı (+1)	Kolçakların arası çok geniş (+1)	Ayarlanabilir Değil (+1)

Sırt Desteği

Bel desteği yeterli. Destek eğimi 95º-110º arası. (1)	Bel desteği yok veya bel pozisyonuna denk gelmiyor (2)	Destek eğimi çok geniş (>110º) ya da çok dar açıda (<95º) (2)	Sırt desteği hiç yok veya çalışan öne eğiliyor (2)	Çalıma yüzeyi çok yüksek. Omuzlar yukarı kalkıyor. (+1)	Ayarlanabilir Değil (+1)

Monitör



Monitör açık kol mesafesinde (40-75 cm) ve göz seviyesinde (1)	Monitör çok aşağıda (<30⁰) (2) Monitör çok uzakta (+1)	Monitör çok yukarıda. Boyunu kaldırmak gerekiyor (3)	Boyunu 30⁰'den fazla döndürmek gerekiyor. (+1)	Ekranda parlama var (+1)	Evrak tutacağı yok (+1)

Telefon

Kulaklık var veya tek el telefonu tutuyor & doğal boyun pozisyonu (1)	30 cm'den daha fazla uzanma gerekiyor (2)	Telefon boyun ve omuz arasında tutuluyor (+2)	Eller Serbest özelliği yok. (+1)

Fare

Fare omuzla aynı eksende (1)	Fareye ulaşmak için kol açılıyor (2)	Fare ve klavye farklı yüzeyler üzerinde (+2)	Fareyi kavramak için parmaklar bükülüyor (+1)	Farenin önünde el/bilek desteği var (+1)

Klavye

Bilek düz, omuzlar rahat (1)	Bilek bükülüyor. Klavye açısı var. (Dışa doğru bükme açısı > 15⁰) (2)	Yazma sırasında bilekler yanlara doğru bükülüyor (+1)	Klavye çok yüksekte. Omuzlar yukarı kalkıyor (+1)	Başüstü elemanlara uzanma gerekiyor (+1)

9. CIRRICULUM VITAE

Kişisel Bilgiler

Adı	Ayşe	**Soyadı**	Alparman
Doğum Yeri	İstanbul	**Doğum Tarihi**	09.03.1991
Uyruğu	TC	**TC Kimlik No**	50770189962
E-mail	ayse_alparman@hotmail.com	**Tel**	533 384 46 14

Öğrenim Durumu

Derece	**Alan**	**Mezun Olduğu Kurumun Adı**	**Mezuniyet Yılı**
Doktora			
Yüksek Lisans			
Lisans	FTR	Yeditepe Üniversitesi	2014
Lise	-		

Bildiği Yabancı Dilleri	**Yabancı Dil Sınav Notu (#)**
İngilizce	Çok iyi
Almanca	İyi

Başarılmış birden fazla sınav varsa(KPDS, ÜDS, TOEFL; EELTS vs), tüm sonuçlar yazılmalıdır

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	**Kurum**	**Süre (Yıl - Yıl)**
Fizyoterapist	Formed	2019 -
Fizyoterapist	Romatem	2015-2018

Bilgisayar Bilgisi

Program	**Kullanma becerisi**
Microsoft Office Programları	İyi
SPSS	Orta

***Çok iyi, iyi, orta, zayıf olarak değerlendirin**