

TC

YEDITEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION

**EVALUATION OF MUSCULOSKELETAL PAIN
AND ITS EFFECT ON QUALITY OF LIFE, SLEEP
QUALITY AND PHYSICAL ACTIVITY ON COVID-
19 LAB TECHNICIANS**

MASTERS THESIS

SALLY AL-ASSAR, PT

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ADVISOR PROF. DR. RASMI MUAMMER

ISTANBUL 2022

THESIS APPROVAL FORM

Institute : Yeditepe University Institute of Health Sciences
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Title of the Thesis : Evaluation of musculoskeletal pain and its effect on quality of life, sleep quality and physical activity on COVID-19 lab technicians.
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This study have approved as a Master Thesis in regard to content and quality by the Jury.

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APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated and numbered

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Director of Institute of Health Sciences

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.

SALLY AL-ASSAR



DEDICATION

I would like to dedicate my thesis to my beloved family for their full support though my degree.



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I would like to acknowledge the efforts Professor Rasmi Muammer has put in to help me through my thesis and for his extended knowledge.

I would also like to thank my dad for this constant support and motivation, my mom for her many prayers and my siblings for the confidence they give me.

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LIST OF SYMBOLS AND ABBREVIATIONS

COVID-19- Corona Virus Disease 2019

CM- centimeter

DNA- Deoxyribonucleic acid

EMT- Emergency Medical Technician

E- Erkek

F- Female

FPS- Faces Pain Scale

IBS- Irritable Bowel Syndrome

IPAQ- International Physical Activity Questionnaire

K- Kadın

Kg- Kilogram

M- Male

MSKP- Musculoskeletal pain/symptoms

MSKD- Musculoskeletal Disorder

MET-min/week total- Metabolic Equivalent Task minutes per week

NRS- Numeric Scale

NMQ- Nordic Musculoskeletal Questionnaire

%- Percent

PCR- Polymerase Chain Reaction

PSQI- Pittsburgh Sleep Quality Index

PA- Physical Activity

RNA- Ribonucleic Acid

RSI- Repetitive Strain Injuries

SPSS- Statistical Package Analysis for Social Sciences

SD- Standard Deviation

VAS- Visual Analogue Scale

VRS- Verbal Rating Scale

WHOQOL-Bref- World Health Organization Quality of Life Questionnaire short form

WMSD- Work related Musculoskeletal Disorder

ABSTRACT

Al-Assar, S. (2022) Evaluation of Musculoskeletal pain and Its Effect on Quality of Life, Sleep Quality and Physical Activity on COVID-19 Lab Technicians. Yeditepe University, Institute of Health Science, Department of Physiotherapy and Rehabilitation, MSc thesis, Istanbul.

This study was conducted to evaluate musculoskeletal pain and its effect on quality of life, sleep quality and physical activity in COVID-19 laboratory technicians (mean age: 28.4 ± 5.2 years, M/F= 12/18). The demographic information of the subjects was recorded using the demographic information questionnaire. In our study, to assess musculoskeletal pain, the Nordic Musculoskeletal Questionnaire (NMQ) was used. To assess the quality of life, the World Health Organization Quality of Life Questionnaire short-form (WHOQOL-BREF) was used. Sleep Quality was evaluated by the Pittsburgh Sleep Quality Index (PSQI) and the Physical activity (PA) was measured by the International Physical Activity Questionnaire short form (IPAQ). Statistical analysis was made by using SPSS 26 software. The prevalence of musculoskeletal pain/symptoms was 93.3%. The anatomical areas with the highest percentage of musculoskeletal pain/symptoms were the neck (57.14%), shoulders (57.14%), the wrists/hands (50%), the upper back (42.85%) and the lower back (35.7%). The most affected domains in quality of life were physical health and social relationships. 71.43% of subjects with musculoskeletal pain/symptoms had poor sleep quality. 100% of subjects with low and moderate physical activity had musculoskeletal pain/symptoms. There's a significantly low and positive relationship between psychological QOL scores and MET-min/week total scores ($r=0.362$, $p<0.05$). PA levels significantly affect physical health and psychological domains in QOL. There was a significant relationship between physical health and psychological domain scores ($r=0.713$, $p<0.01$); physical health and environment domain ($r=0.468$, $p<0.01$). In conclusion, an interference should be done to prevent WMSDs in laboratory technicians. Exercise and education should be given.

KEYWORDS: laboratory technicians, musculoskeletal pain, Pittsburgh sleep quality index, quality of life, physical activity.

ÖZET

Al-Assar, S. (2022) COVID-19 Laboratuvar Teknisyenlerinde Kas İskelet Ağrısı, Yaşam Kalitesi, Uyku Kalitesi ve Fiziksel Aktivite Üzerine Etkisinin Değerlendirilmesi. Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Yüksek Lisans Tezi. İstanbul.

Bu çalışma, COVID-19 laboratuvar teknisyenlerinde kas-iskelet sistemi ağrısı, bunların yaşam kalitesi, uyku kalitesi ve fiziksel aktivite üzerindeki etkisini değerlendirmek amacıyla yapılmıştır (28.4 $\pm$ 5.2 yıl, E/K=12/18). Deneklerin demografik bilgileri demografik bilgi anketi kullanılarak kaydedilmiştir Çalışmamızda kas-iskelet sistemi ağrılarını değerlendirmek için Nordic Kas İskelet Anketi (NMQ) kullanılmıştır. Yaşam kalitesini değerlendirmek için Dünya Sağlık Örgütü Yaşam Kalitesi Ölçeği-Kısa Formu (WHOQOL-Bref) kullanılmıştır. Uyku Kalitesi Pittsburg uyku kalitesi ölçeği (PSQI) ile değerlendirilmiştir. Fiziksel aktivite Uluslararası Fiziksel Aktivite Anketi kısa formu (IPAQ) ile ölçülmüştür. İstatistiksel analiz SPSS 26 yazılımı kullanılarak yapılmıştır. Kas-iskelet sistemi ağrısı/semptomu prevalans %93,3 olarak bulunmuştur. Kas-iskelet sistemi ağrılarının/semptomlarının en yüksek oranda görüldüğü anatomik bölgeler boyun (%57,14), omuzlar (%57,14), bilekler/eller (%50), üst sırt (%42,85) ve alt sırt (%35,7) olmuştur. Yaşam kalitesinin en çok etkilendiği alanlar fiziksel sağlık ve sosyal ilişkiler olmuştur. Kas-iskelet sistemi ağrısı/semptomu olan bireylerin %71,43'ünün uyku kalitesi düşüktür. Düşük ve orta düzeyde fiziksel aktiviteye sahip deneklerin %100'ünde kas-iskelet sistemi ağrısı/semptomları görülmüştür. Psikolojik yaşam kalitesi puanları ile MET-dk/hafta toplam puanları arasında anlamlı derecede düşük ve pozitif bir ilişki vardır ($r=0.362$, $p<0.05$). Fiziksel aktivite düzeyleri, yaşam kalitesinin fiziksel sağlık ve psikolojik alanlarını önemli ölçüde etkilemektedir. Fiziksel sağlık ile psikolojik alan puanları arasında ($r=0.713$, $p<0.01$); fiziksel sağlık ile çevre alanı arasında ($r=0.468$, $p<0.01$) anlamlı bir ilişki bulunmuştur. Sonuç olarak, laboratuvar teknisyenlerinde işle ilgili kas-iskelet sistemi rahatsızlıklarının önlenmesi için girişimde bulunulmalı. Egzersiz ve eğitim verilmelidir.

Anahtar Kelimeler: Laboratuvar Teknisyenlerinde, kas-iskelet sistemi ağrılarını, Pittsburg uyku kalitesi ölçeği, Yaşam Kalitesi Ölçeği, Fiziksel Aktivite

1. INTRODUCTION AND PURPOSE

Corona virus disease is defined by the World Health Organization as “an infectious disease caused by the SARS-CoV-2 virus” (1)

Laboratory technicians or otherwise known as medical laboratory scientists perform one of the most important jobs in healthcare. Without their work, differential diagnosis would almost be impossible. Nevertheless, during the COVID-19 pandemic they were and still are responsible for extracting the result of a polymerase chain reaction (PCR) test and concluding it as a positive or negative result. During the pandemic, the laboratory technicians worked long hours and were under extreme stress due to the amount of testing during the pandemic which would logically result in less time available for physical activity, sleep and socializing.

During their laboratory work they are exposed to a number of risk factors for musculoskeletal disorders which include shoulder, back and neck injuries as well as other muscles exertion which are exasperated by their conditions in the working environment. (2) This reasoning including the position in which the work is done which is standing for most of the hours with repetitive wrist movements and bad kyphotic posture.

Work-related musculoskeletal disorders (WMSDs) are musculoskeletal disorders that are represented as discomfort, impairment, dysfunction, or persistent pain in joints, tendons, muscles, as well as other soft tissues, either without or with physical display of symptoms.(3–6) WMSDs are usual health issues and a growing cause of dysfunction/disability. (2) Healthcare workers are prone to plenty of physical threats such as shoulder and back injuries as well as muscle and joint strain, that are worsened or continued by work circumstances.(7) Laboratory technicians have been said to be part of the sedentary jobs and a lot of the time the pressure in this work that can influence their musculoskeletal system making their decrease in job tasks unnoticed.(2)

Due to the lack of literature regarding this exact subject, the purpose of this thesis was to evaluate the prevalence of musculoskeletal pain/symptoms caused by long working hours in a COVID-19 testing laboratory and to investigate its effects on quality of life,

sleep quality and physical activity. The long hours standing in addition to bad posture and repeated movements will most likely cause pain and discomfort in areas of the body like the wrists, low back, neck, etc. and therefore it might have its effects on day-to-day life. We will also be looking at the relationships and correlation between the musculoskeletal pain/symptoms and disorder with quality of life, sleep quality and physical activity.

This study will add to the literature since no one has previously studied these effects on the COVID-19 technicians and will allow healthcare industries to be more aware of the consequences of long working hours on the health of their workers. This study can be used to educate technicians on the result of their long working hours which will help them in taking preventative measures.

Two hypotheses were decided for this study:

H0 there is no relationship between musculoskeletal pain/symptoms with quality of life, sleep quality and physical activity.

H1 there is a relationship between musculoskeletal pain/symptoms with quality of life, sleep quality and physical activity.

Specific objectives of this research:

- Evaluation of MSKD and its prevalence in COVID-19 lab technicians.
- The relationship between MSKP and quality of life.
- The relationship between MSKP and sleep quality.
- The relationship between MSKP and physical activity.

2. GENERAL INFORMATION/LITERATURE REVIEW

2.1. PCR Mechanism

As explained by the Mayo clinic magazine, after a patient's nasopharyngeal swab has been dropped off to the lab, the sample will be managed so that the RNA is secluded and collected whereas everything else is discarded. The RNA is integrated with other elements: DNA building blocks, enzymes (DNA polymerase and reverse transcriptase), cofactors, probes and primers that recognize and bind to SARS-CoV-2. Then the viral RNA is transformed to a DNA copy, it is then transformed into millions of copies using PCR that can be effortlessly identified. (8)

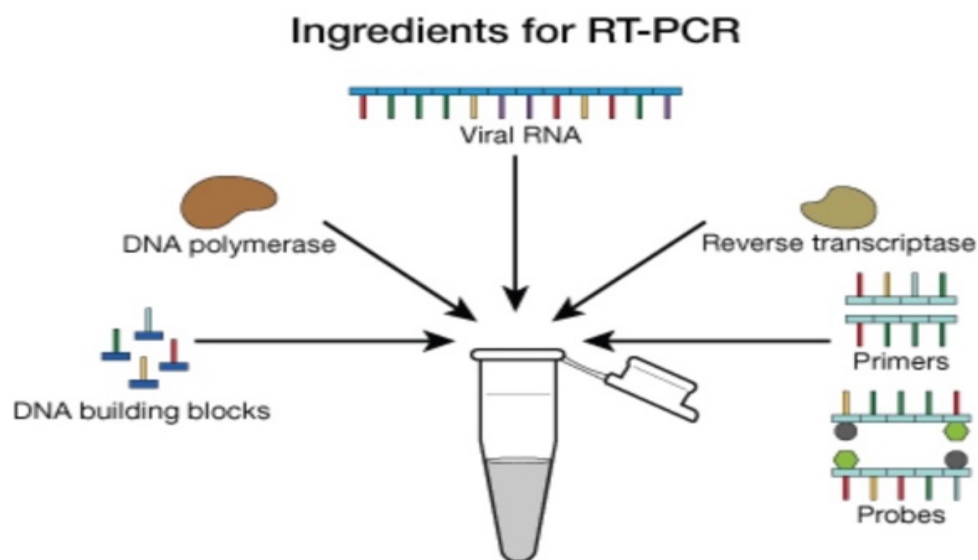


Figure 1Ingredients for RT-PCR (8)

RNA must be converted to DNA

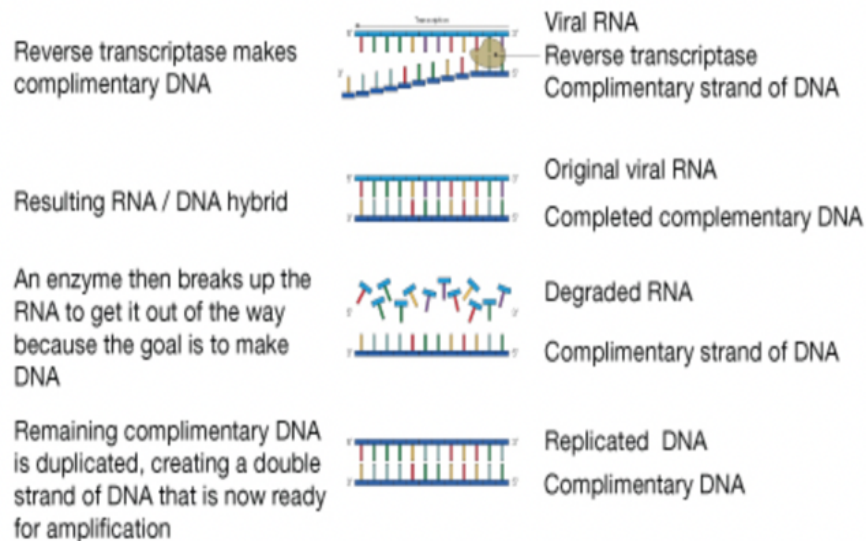


Figure 2 RNA transformed to DNA (8)

Then, using heat and enzymes, changed viral DNA strands are forced apart. Short primers of DNA matching the complementary strand of the viral DNA template stick together, operating as a synthetic start spot for DNA synthesis. Then the synthetic DNA is made longer by connecting the chemical building blocks of DNA to make a copy of the viral DNA template. Present in the reaction is a second primer that is made in the opposite direction of the first primer therefor making a copy of the first synthesized strand. After the first round of DNA synthesis the process is repeated time after time to allow the machine used to verify the presence of the viral SARS-CoV-2 DNA responsible for a positive COVID test result. (8)

2.2. Pain

Chronic pain is less common in developed countries when compare to developing countries. (9) Low income countries like Latin America, Africa and Asia it was found that they had a higher probability of WMSDs, LBP, unspecified chronic pain and migraines. (10) These types of pains result in an increase of medical costs, financial loss and ruins personal lives of these workers. (11)(12)

2.2.1. Physiology and Pathophysiology of Pain

Nociception is the neurophysiological procedure where the noxious mechanical, chemical or thermal stimuli are transformed into electrical signals by nociceptors which is a type of sensory receptors that detect painful stimuli. They are made up of Alpha Delta fibers (small, myelinated fibers that detect fast, localized sharp pain) and C fibers (smaller unmyelinated that detects slow, poorly localized pain like throbbing). These nociceptors bring information through the afferent system into the spinal cord, into the spinothalamic tract and into the thalamus by the second order neuron. (13,14)

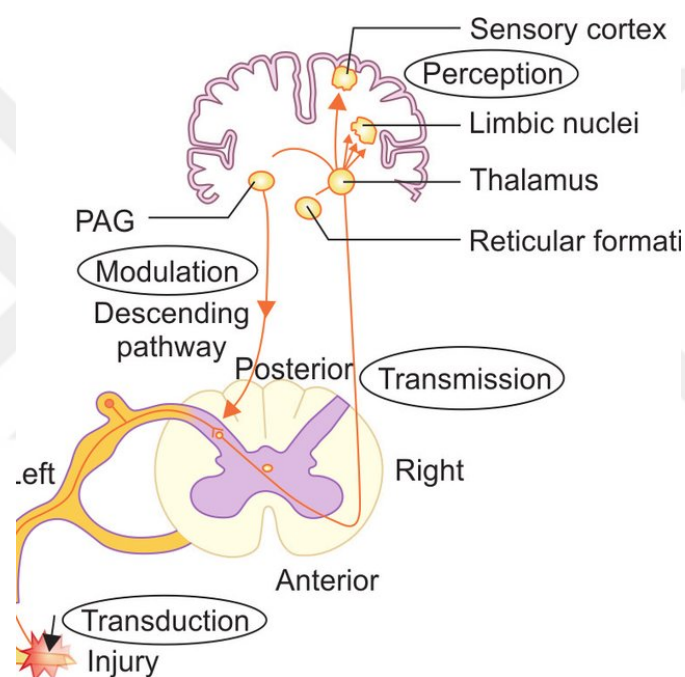


Figure 3 Pain transmission (15)

The ascending pathway is responsible for transmitting pain signals to the brain (Thalamus). The first order neuron takes the pain signal and transmits it's to the dorsal horn in the spinal cord where chemicals called substance P is produced in order for the first order neuron to relapse with the second order neuron and then the second order neuron is transmitted into the spinothalamic tract to the thalamus where it then relapses with the third order neuron that transmits the signal back to the body. (15)

Tissue and nerve damage can result in pathologic pain which can be non-nociceptive (initiation of low threshold sensory receptors) or nociceptive (initiation of high threshold nociceptors). Prostaglandins, cytokines, bradykinin, histamine, nerve growth

factor and chemokines are all parts of the chemical mediator “sensitizing soup” produced by tissue damage or inflammation. (13)

Peripheral sensitization or hypersensitivity to no painful stimuli (primary hyperalgesia) is produced by these chemical signals that sensitize peripheral nerve terminals which then converts high threshold nociceptors to low threshold nociceptors which activates quiescent or "silent" receptors. Central sensitization which produces allodynia (pain outside the area of tissue injury) is a result of a more intense nerve injury or tissue trauma that creates electrical signals that endlessly attack dorsal horn neurons and therefor sensitizing the central nervous system which is responsible for viewing any stimuli other than nociception as painful (secondary hyperalgesia). Neuroplasticity or permanent change in how sensory inputs are administered due to these pathologic neurophysiological processes result in chronic pain syndromes. (13,14)

2.2.2 Physiologic vs Pathologic Pain

Pathological pain is non-protective and maladaptive that is due to injury or atypical functioning of the nervous system. One type of pathological pain is neuropathic pain which is pain following damage or disease of the somatosensory nervous system, an example for peripheral neuropathic pain would be trigeminal neuralgia and an example for central neuropathic pain would be spinal cord injury pain and pain after a stroke. The second type of pathological pain is the central nervous system (CNS) dysfunctional pain that is from the CNS's inability to perform its job like fibromyalgia and IBS. (16)

Physiologic pain is pain that helps protect the body, it is biologically useful and adaptive. There are two types of physiologic pain which are nociceptive and inflammatory pain. The nociceptive pain is due to the activation of nociceptors due to noxious stimuli which then protects the body by having a fast reaction to the pain. Whereas inflammatory pain results in activation of the inflammation system due to tissue damage which could be due to many things like ischemia, infection or trauma which in result increases peripheral sensitization therefor having more reaction to usually non-painful stimuli and therefor changing the behavior of the body by decreasing movements or other things that will help with healing. (16)

2.3. Tools Used to Measure Musculoskeletal Pain Intensity

There are 4 instruments that have been widely used to measure the pain intensity which are the Numerical scale, the faces pain scale, the verbal rating scale and the visual analogue scale that are shown in the figure below. (17)

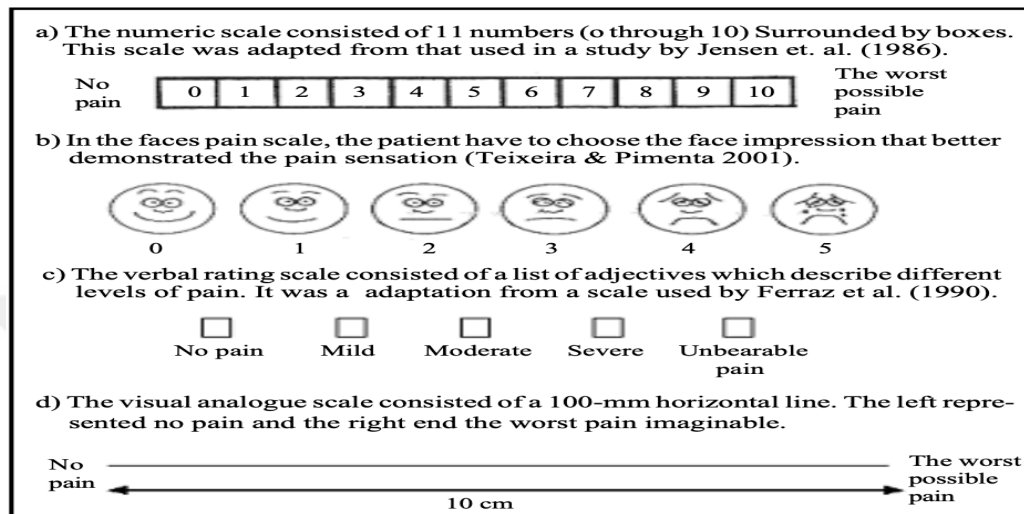


Figure 4 Pain intensity scales (17)

Any of the scales in figure 4 work well and therefore when choosing a scale, clinicians should look at the conditions like the ability to process information and the ability to speak the language in the scale. (18)

Detecting a decrease in pain was valid by all 4 scales but detecting an increase in pain was found to be more valid using the VAS, NRS and FPS and generally, it was seen that the NRS was the most sensitive and stable scale between them and the FPS was the best choice if there was a difficulty or inability to use the NRS. (19)

2.4. Pain Prevention

The stages of prevention not only prevent the onset of disease through decreasing the risk but also decrease complications of an ongoing disease. These stages are listed in literature as: (20)

- Primordial prevention which concentrates on social and environmental conditions, and it is usually done through policies and laws which focuses on the underlying

conditions that stimulates disease onset. For example, having better access to safe sidewalks and in turn increasing physical activity and therefor preventing obesity.

- Primary prevention which inhibits a disease from ever happening in individuals who are healthy, and it includes doing something that limits the risk of exposure or increasing the immunity of individuals at risk to prevent disease progression for example immunizations.
- Secondary prevention focuses on early detection of a disease, and it focuses on individuals who look healthy but have an underlying disease. It includes forms of screening like the pap smear which aims to prevent cancer spreading.
- Tertiary prevention which focuses on the clinical and outcome phases of the illness and works on reducing the disease severity in patients with ongoing symptoms or in other words, reducing the effects if the illness.
- Quaternary prevention which helps patients to avoid medical interventions that may be harmful to them.(20,21)

Detecting main factors that are related to the onset of WMSDs and their incidence may help come up with a primary prevention intervention. (22)

Repetitive movements, long working hours, awkward posture and bad working conditions could all be factors for the onset of WMSDs. (23)

Even though a decrease in pain intensity may not occur, chronic pain management is mainly concentrated on tertiary prevention, tolerance and acceptance, and increasing function. When comparing individuals with chronic pain to those with acute pain, the health care system must work in different manner.(24)

In a literature studying the effects of primary preventions such as participatory ergonomics and healthy lifestyle program as well as secondary and tertiary preventions that included a tailored case management on musculoskeletal pain/symptoms, it was found that the interventions reduced neck, shoulder and upper back pain and in order to prevent and manage musculoskeletal pain/symptoms, the intervention should include the three levels of prevention. (25)

While working in a laboratory, having a neutral posture allows the body to be in the least amount of strain and prevents any disorders. To achieve the neutral posture the laboratory technician should follow these points: (26–28)

- Shoulders at the same alignment as the hips.
- Ears above the shoulder.
- Wrists should always be straight and not bent.
- Forearms should be at a 90-degree angle from the upper arms.
- Relax the shoulders.
- Elbows close to the sides of the body.

2.5. Musculoskeletal Disorders

Musculoskeletal disorders are the primary health issue associated with work that affects both genders in all age groups equally all around the world and in every work sector (29). Pain from these musculoskeletal disorders may also restrict engaging in physical activity and can also be a risk factor for chronic illness (30–34). A systematic review and meta-analysis study that included 20 articles with 11 studies having sufficient data concluded that subsequently, musculoskeletal conditions can increase the risk of chronic disease and that early management and treatment as well as prevention of musculoskeletal disorders may prevent chronic disease (35). Therefore, it is important to conduct studies in the area of musculoskeletal conditions and how it could have large risk factors like sleep and other lifestyle choices which is a subject that is ignored in the research area (35).

Appropriate evidence exists which suggests that risk factors like constant repetition, uncomfortable posture and lifting heavy objects are directly associated with work related musculoskeletal disorders (6). In a study evaluating the presence of musculoskeletal problems in laboratory technicians using the Nordic musculoskeletal questionnaire in Spain had results that 84.5% of their sample had a muscular discomfort and that 35.08% of the technicians showed that the right shoulder and neck were affected at the same time suggesting that the musculoskeletal disorders among Spanish laboratory technicians was very high with the most affected part of the body being the neck at 51.1%, the dorsal-lumbar area at 41.7%, the right shoulder at 33.4% and the wrist at 29% (29). In the same study the women showed double the chance of having musculoskeletal symptoms

compared to men and as for age, the chance of having disorders was 8 times more for those above the age of 46 years but a correlation between age and disorder resulted in 74.19% of the technicians that are less than or at the age of 25 having musculoskeletal symptoms with 25.81% having no symptoms (29).

In Saudi Arabia, a questionnaire-based cross-sectional study was done to calculate the prevalence of musculoskeletal disorders in clinical laboratory technicians and found that the overall occurrence in WMSDs in 12 months in whichever body part was 82% with lower back being the highest (61%) and elbows lowest (10%). Moreover, technicians that worked standing had low back pain at a degree of 66.7% and feet and ankles pain at 33.5% with the ones sitting having less pain in all aspects (36).

Furthermore, another cross-sectional study used the Nordic musculoskeletal questionnaire to determine musculoskeletal symptoms in laboratory workers and its relation to individual and physical activity related to their work with findings of 52.04% of the workers having symptoms with shoulders being the highest presenting 33.5% and that three quarters of the findings were female. Also, increased work related physical activity found to have more musculoskeletal symptoms in comparison to those who did not exert much physical activity (37).

In a descriptive cross-sectional study that assessed 140 healthcare laboratory technicians in all department's risk factors for developing WMSDs came to a finding that all the laboratory technicians are at an ergonomic risk that was cause by repetitive and static postures at work like pipetting stations. Therefore, they are encouraged to have preventative measures before developing and WMSD symptoms. (38)

2.5.1. Overuse/Repetitive Disorders

During common laboratory procedures such as pipetting, working at microscopes, operating microtomes, utilizing cell counters, and using video-display terminals, laboratory technicians are at risk of repetitive motion injuries. (39)

The table below shows some examples of upper extremity disorders and their risk factors and symptoms.

Table 1 Repetitive disorders risks and symptoms. (40)

Identified disorders, occupational risk factors and symptoms		
Disorders	Occupational risk factors	Symptoms
Tendonitis/tenosynovitis	Repetitive wrist motions Repetitive shoulder motions Sustained hyper extension of arms Prolonged load on shoulders	Pain, weakness, swelling, burning sensation or dull ache over affected area
Epicondylitis (elbow tendonitis)	Repeated or forceful rotation of the forearm and bending of the wrist at the same time	Same symptoms as tendonitis
Carpal tunnel syndrome	Repetitive wrist motions	Pain, numbness, tingling, burning sensations, wasting of muscles at base of thumb, dry palm
DeQuervain's disease	Repetitive hand twisting and forceful gripping	Pain at the base of thumb
Thoracic outlet syndrome	Prolonged shoulder flexion Extending arms above shoulder height Carrying loads on the shoulder	Pain, numbness, swelling of the hands
Tension neck syndrome	Prolonged restricted posture	Pain

2.6. Laboratory Risks from Equipment

2.6.1. WMSDs from Pipettes

The use of pipettes is believed to cause upper limb disorders in laboratory technicians. Pipettes are tools used by hand that distribute small, specific amounts of liquid with a button activated by being pressed by the thumb. (41) Repetitive and precise upper limb movements are used with large amounts of samples in laboratories which is inside a narrow and restrictive biosafety cabinet. (42)

In two cross-sectional studies, it had been stated that subjects who used pipettes had upper limb symptoms more often than non-pipette users and that the subjects that used the pipette more intensely had more upper limb symptoms than the less intense pipette

users. (43) In a study looking at laboratory workers upper limb in relation to their use of pipettes they found that the amount of pipette work was directly correlated to symptoms in the upper limb as well as impingement syndrome and muscle pain in the shoulder. (41)



Figure 5 Pipetting in COVID-19 Lab

2.6.2. WMSDs from Microscopes

Laboratory workers use microscopes as a diagnostic tool to assist doctors in making decisions and saving lives but aren't conscious of the risks their health is put at and might result in complications like chronic pain syndromes. (44,45)

Problems like chronic pain syndromes and eye pain can be associated with repetitive eye movement, eye strains, visual problems and fatigue from the inability to adjust the eye of the microscope. (46,47)

In a study that included fifty laboratory technicians that frequently used a microscope, 62% had musculoskeletal problems that were mostly in the neck and back, 94% had visual problems and 44% were overwhelmed mentally due to the long working hours on the microscope.(48)

2.7. Quality of Life

Quality of life is defined by the world health organization (WHO) as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns (49).

The observation of health and life quality in patients has been the topic of interest in research in the recent years but research about healthcare workers quality of life is lacking. Researching this area could be used to improve the use of assistance and interventional measures and to decrease the negative impact it would have on their well-being. Decreasing workload on workers in healthcare will possibly improve life quality (50). High level stress due to work has been the identity of healthcare workers and it is a known aspect that may decrease a person's quality of life (51–54).

An observational study assessing the quality of life of 200 healthcare workers was conducted in 2018 with results being that the overall quality of life among the 200 workers was average with areas of occupational stress and quality of life of healthcare workers (55). It concluded that it is of high importance to know the satisfaction of quality of life of workers in order to guarantee that the quality of their work outcome is excellent and that they'll be able to cope with work stress (55).

2.8. Quality of Life and Pain

The most popular complain medically is pain but no matter its popularity, many people still experience undertreated or constant pain which in turn has a harmful effect on daily activities in many pain victims (56). When untreated or not taken care of, the quality of life can be harmed by pain which will in turn result in functional impairment, sleep deficiency and psychological problems (57). In a study of The Impact of Pain on Quality of Life and the Unmet Needs of Pain Management, the results showed that substantially fewer pain sufferers reported that they were in good to excellent health with $P < 0.05$. However, people suffering from chronic pain felt less confident in their ability to care for themselves when compared to the over-all population with $P < 0.05$ which was supported

by chronic and acute pain patients indicating a decreased capacity to engage in activities. Together, these findings show that moderate to moderately severe pain can have a number of negative impacts on patients and significantly lower overall quality of life (56).

In a cross-sectional study in 2015 regarding 75 nurses that worked as EMTs, the nurses that to the lowest degree had one kind of pain showed no significant difference in their quality of life with $P > 0.05$ but in fact it did result in a statistically significant difference in depression level compared to the pain degree (58).

2.9. Quality of life and Sleep

Sleep is important for mental health, physiological functions and homeostatic adaptation of the body and it also seems to be vital in increasing the quality of life of chronic subjects in its own way. (59) (60)

In a study evaluating the correlation of the quality of sleep and quality of life in nurses, it was found that 72% had poor sleep quality who then 11.8% had poor quality of life, 51.4% having medium quality of life and 36.8% having good life quality and therefor concluded that decreasing the quality of sleep appeared to reduce life quality in different ways. (59)

Examining sleep quantity and quality should be done often due to its connection with the quality of life and that the result of their study proposes that at least some quality of life areas are mostly always disturbed with patients having sleep disorders. (61)

2.10. Quality of Life and Physical Activity

Another study in Greece in the year 2019 presented that physical activity intensity (low, medium and high) had no impact on the quality of life of their sample but that low physical activity had other effects on quality of life factors like mental health, vitality, social activity, physical functioning and pain (62).

As anticipated, medical problems do in fact have a negative effect on almost all the aspects of quality of life of the study population which was confirmed by other related studies (63,64). They also established that neither family status nor work assignment are related to quality of life and therefor concluded that the intensity of physical activity cannot improve the quality of life which is multifactorial (62).

2.11. Musculoskeletal Pain and its Effect on Sleep Quality

Sleep is an active physiological state that is needed for hemostatic adaptation, psychological wellbeing, physiological functions and maintaining hormonal, metabolic and biochemical functions (59,65).

The measurement of sleep quality relates to both the subjective perception of sleep, which corresponds to the gratification with one's self - reported sleep experience, along with factors of initiation, preservation, and amount of sleep as well as nourishment upon awakening, and the objective quality of sleep, which is the cumulative number of hours spent sleeping, the structure of that time, the span of time that was awoken while sleeping, and the frequency of nighttime awakenings. (66,67)

The measurement of sleep quality has been done in physicians and nurses during the pandemic, but no study involved the laboratory technicians nor the relationship between musculoskeletal pain/symptoms and disorder and its relation to sleep quality.

Pain affects both next night sleep quality and next night sleep duration. Also, sleep quality cautiously anticipated next day pain. (68) Pain also not only disrupts day to day activities it also interferes with sleep, falling asleep and staying asleep was hard for both chronic and acute pain patients with 29% of the time for acute and 38% of the time with chronic patients. In association with the people with no pain, the chronic pain population stated more sleep disturbances and decrease of quality of sleep which affected day to day activities in the upcoming day (56).

Only a few studies of sleep quality in healthcare workers were done during the COVID-19 pandemic with this study highlighting the need for more research in the area as the results were that nearly 60% of both front line and non-front line health care workers suffered with poor sleep quality and stress which in fact is probably related to the COVID-19 pandemic. (69)

Musculoskeletal disorders have been uncovered to be work related by physically challenging work and in contrast, sleep disorders were found to be only related to psychological stress from work and not something physical like musculoskeletal pain/symptoms so the way in which musculoskeletal pain/symptoms would be reduced is

by reducing physical workload and improving sleep quality would require a decrease in psychological stress.(70)

Musculoskeletal pain/symptoms is correlated with long or short sleep duration and that sleeping more than 9 hours or less than five hours was considerably linked with having musculoskeletal pain/symptoms and that having musculoskeletal pain/symptoms in several areas was more in those who slept for less than 5 hours or more than 9 hours than those who slept for 7 hours. (71)

In a Danish cross-sectional study of 3600 hospital workers, it was discovered that both stress and musculoskeletal pain/symptoms are linked with poor sleep and that hospital management should apply strategies for avoiding stress and musculoskeletal disorders. (72)

2.12. Physical Activity and Musculoskeletal Pain

Physical inactivity is an acknowledged and widespread health issue that is usually avoided due to musculoskeletal pain/symptoms. Chronic multi sites musculoskeletal pain/symptoms had been linked with short step count and a low amount of moderate to vigorous physical activity. (73)

Following the global recommendations on physical activity for health that was given by the world health organization is correlated to an increase in work ability amongst middle aged (50-64 years) and adult (30-49 years) women and it was come to light that there is a relationship between following the physical activity recommendation and the severity and regularity of musculoskeletal pain/symptoms amid middle-aged women. (74)

Healthcare professionals who participate in supervised group-based exercise with inspirational coaching sessions throughout the day are more likely to improve their pressure pain threshold and have less foot and lower back discomfort than those who exercise alone at home. (75)

Due to the potential benefits of physical activity on variables such as psychological, physiological, and environmental aspects which affect job satisfaction, a continuum of regular physical activity may also boost total job satisfaction and quality of life. (76)

Sedentary behavior is linked to musculoskeletal disorders, chronic illnesses, and their risk factors. (77) In a study assessing the efficacy of an exercise reminder software program on office workers, it was discovered that the VAS-measured degree of subjective pain was significantly reduced in the program group compared to the control group. (78)



3. MATERIALS AND METHODS

3.1. Subjects and Ethical Aspects of the Study

This study was conducted in MENA COVID laboratory in April 2022. The identified participants signed a consent form (Appendix 1) and were educated about the research study. The study protocol was approved by the ethical committee board of Yeditepe University on April 27, 2022, with issue number 202203Y0203 (Appendix 2). Permission from the laboratory was also obtained (Appendix 3) As well as permission from the NMQ, IPAQ, PSQI and WHOQOL authors were obtained (Appendix 4). 45 laboratory technicians participated in this study which later excluded 15 and therefore a final number of 30 laboratory technicians participated in this study. Out of the 30 participants, 60% were female (n=18) and 40% were male (n=12).

Eligibility criteria

Inclusion criteria were based on the following:

- Working as a COVID-19 lab technician.
- Age between 18 to 60 years.
- Working as a lab technologist in a COVID testing laboratory for a minimum of 1 year.
- Has no previous musculoskeletal injury within the last year.
- No previous sleeping disorder.
- No current or previous neurological disease.

Exclusion criteria were based on the following:

- Any history of chronic disease.
- Current acute or chronic illness.
- Musculoskeletal or neurological injury.
- Subject refused consent.
- Working another job at the same time.
- Currently pregnant.
- Current menstruation at the time of the survey.

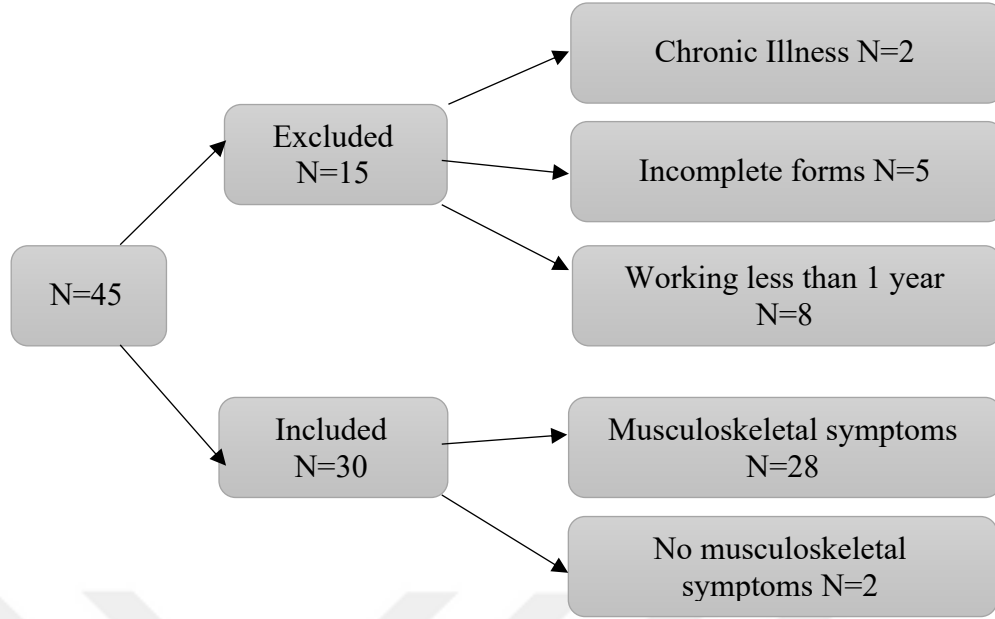


Figure 6 Process of exclusion and inclusion of sample

3.2. Determination of Sample Size

Çingil (1994) stated a formula for calculation of sample size in groups with known population number:

$$n = \frac{Nt^2pq}{d^2(N-1) + t^2pq}$$

N : Population

n : Sample size

p : Sample proportion

q : 1-sample proportion

t : Critical value

d : Acceptable error rate

The sample size was obtained as 30 for the conditions of which population number is 44, which the sample proportion is 0.5, which the acceptable error rate for sample is 0.10 and critical t value with 95% confidence interval is 1.96. (79)

The power analysis will be made using G Power 3.30. One of the main purposes of this study is to see the relationship between psychological and sleep quality. For this study, the highest relationship was found as -0.452 between psychological and sleep

quality. The power of the study is found %82 in which conditions that the samples size is 30, error rate is 0.05 and the correlation between variables is 0.452

3.3. Study Protocol

All outcome measures were done using the surveying method both by email and in person.

- 1) Demographic information Questionnaire was used to collect information on gender, age, marriage status, weight, height, current job title, years working as a laboratory technician, working hours per day and if they have any chronic illness.
- 2) Musculoskeletal symptoms were analyzed by the Standardized Nordic Musculoskeletal Questionnaire both the general and specific NMQ were used.
- 3) The Quality of life was measured using the World Health Organization Quality of life questionnaire (WHOQOL-BREF).
- 4) The sleep quality was measured by the Pittsburgh Sleep Quality Index (PSQI).
- 5) The physical activity was measured using the short form of the International Physical Activity Questionnaire (IPAQ).

3.4. Evaluation

3.4.1 Demographic Information of the Participants.

The demographic info that includes information on gender, age, marriage status, weight, height, current job title, years working as a laboratory technician, working hours per day and if they have any chronic illness were collection using the demographic information Questionnaire. (Appendix 5)

3.4.2. Musculoskeletal Symptoms Evaluation

The standardized Nordic questionnaire is used to analyze musculoskeletal symptoms in an ergonomic or occupational health context. The information it gives helps introduce preventative measures or a start for a more in-depth examination. (Appendix 6)

There are two kinds of questionnaires:

- 1) General questionnaire for simple surveying. This is made up of 40 items that the subjects are forced to choose from based on the areas of the body causing

musculoskeletal symptoms. A map of the body is attached to help identify the 9 sites on the body being the neck, shoulders, elbows, wrists/hands, upper back, low back, hips/thighs, knees and the ankles/feet. Then, the participants are asked if they had any musculoskeletal trouble in the past 12 months and past 7 days and if it affected their activities of daily life and work.

- 2) Specific questionnaire specifying on low back and neck/shoulders for a more in-depth analysis. It includes 25 questions which that ask if the body part was hurt in an accident, if it reduced activities at work or home, the duration of symptoms and problems, if they've seen a therapist or doctor for their symptoms and if there was trouble in the area in the past 7 days. (80) (81)

The reliability has shown to be acceptable for this questionnaire. (80) In another study, the standardized Nordic musculoskeletal questionnaire was found to have moderate to perfect reliability and good validity. (82)

3.4.3. Quality of Life Evaluation

The quality of life is evaluated using the World Health Organization Quality of Life Questionnaire (WHOQOL-BREF), a shorter version of the WHOQOL-100 that contains four domain structures: (Appendix 7)

- 1) Physical health.
- 2) Psychological
- 3) Social relationships
- 4) Environment

The use of the WHOQOL-100 was found to be too lengthy for practical use and therefore the shorter form WHOQOL-BREF was developed, and it includes 26 questions in total. Each question is answered from 1 to 5 with each number meaning a different thing for each question. Every domain score is then calculated by specific equations into a raw score which is then changed to a transformed score of 4-20 and 0-100 with higher scores meaning better quality of life. (83)

WHOQOL-BREF was deemed reliable and valid as an alternative to WHOQOL-100 and it is most useful in brief assessments of quality of life in clinical trials and in the assessment of treatment effectiveness. (84)

3.4.4. Sleep Quality Evaluation

The sleep quality was evaluated by the Pittsburgh Sleep Quality Index (PSQI). (Appendix 8)

The PSQI is a questionnaire that is filled by the participant, and it measures the sleep quality and disturbances over a one-month time. It is made up of 19 self-rated questions and 5 questions rated by a roommate or partner if available. These questions are combined to form 7 component scores with each component score being a range of 0 to 3 with 0 meaning no difficulty and 3 severe difficulty. Then, the 7 component scores are added to make a global score that ranges from 0-21 with 0 meaning no difficulty and 21 meaning severe difficulty in all areas. (85)

The 7 components are:

- 1) Subjective sleep quality
- 2) Sleep latency
- 3) Sleep duration
- 4) Habitual sleep efficiency
- 5) Step disturbances
- 6) Use of sleep medication
- 7) Daytime dysfunction

The goals of the PSQI are:

- To measure sleep quality in a reliable and valid way.
- To differentiate between bad and good sleepers
- To provide an easy-to-use questionnaire that is easy to interpret by researchers and clinicians.
- To be used clinically to evaluate sleep disturbances effect on sleep quality.

The PSQI is reliable and with a sensitivity of 98.6% and a specificity of 86.5%. (85) In relation to content validity, classical test theory, construct validity, and criterion validity of the PSQI were good. (86)

3.4.5. Physical Activity Evaluation

Physical activity was measured using the International Physical Activity Questionnaire (IPAQ). (Appendix 9) Short form IPAQ was used in this study to assess the physical activity across a broad spectrum of domains.

These domains are:

- 1) Leisure time physical activity
- 2) Domestic and gardening (yard) activities
- 3) Work-related physical activity
- 4) Transport-related physical activity

These 4 domains contain three specific types of activity which are walking, moderate intensity activities and vigorous intensity activities. The short form total score is derived by an automatic report on excel provided by the IPAQ website that requires the duration in minutes and frequency by days of walking as well as moderate intensity and vigorous intensity activities. The Metabolic Equivalent (MET; multiples of resting energy expenditure) was used to calculate each category's reported minutes per week as a continuous score.

Continuous score is calculated by this formula, The MET-min per week: MET level x minutes of activity/day x days/week. The Categorical score is composed of three levels of physical activity:

- 1) Low
- 2) No activity reported OR
- 3) Some activity reported but not enough to be moderate or high.
- 4) Moderate
- 5) Can be any oof these 3
- 6) 3 or > days of vigorous activity for at least 20 minutes/day
- 7) 5 or > days of moderate intensity activity and/or walking minimum of 30 minutes per day
- 8) A combination of walking, moderate intensity/ vigorous intensity activity for 5 or more days with at least a 600 MET-minutes/week.
- 9) High

- 10) One of these two
- 11) Vigorous intensity activity for at least 3 days having minimum of 1500 MET-minutes/week.
- 12) Combination of walking, moderate or vigorous intensity activity for 7 or more days with 3000 MET-minutes/week.

The Short Form IPAQ questionnaire used has been shown in a previous study to have an acceptable test-retest reliability and criterion validity. (87)

3.5. Statistical Analysis

Data analysis was made by using SPSS 26 software. The frequency distribution for the various variables initially were obtained and the descriptive statistics for continuous scores were obtained. For statistical analysis Kruskal-Wallis analysis method and Mann-Whitney U analysis method was used for the comparison of continuous scores. Since the sample size is not big enough for the physical activity level, these non-parametric methods were used. Tabachnick and Fidell stated that the sample size should be at least 30 in each group of independent variables for comparison of scores. (88) If the categorical variables have at least three categories, Kruskal Wallis method can be used however if the categorical variables have two categories, Mann-Whitney U analysis method can be used. Moreover, when significant difference is obtained by using Kruskal Wallis method between categorical variable, from which groups the difference arises can be compared in pairs and at this point Mann-Whitney U analysis method can be used. (89) The relationship between some scores is investigated by using Pearson correlation coefficient. Baykul stated about interpretation of correlation coefficient (r) that If $r < 0.40$, it shows low relationship; if r is between $0.40-0.70$; it shows mediate relationship and if $r > 0.70$, it shows high relationship. (90) All statistical analysis were made at $p < .05$ error level.

4. RESULTS

4.1. General Results of the Participants

4.1.1. Demographic Results of Participants

The demographic information of the participants included mean values of their age, years working, working hours per day, weight and height. These values have been shown in table 4.1.1.

Table 2. The Demographic Information of Participants

Demographic Information	Minimum	Maximum	Mean ($\pm$ sd)
Age	24	48	28.4 $\pm$ 5.2
Years working	1	25	4.3 $\pm$ 4.5
Working hours/day	8	12	8.5 $\pm$ 0.9
Weight	50	120	73.2 $\pm$ 16.5
Height	150	195	170.3 $\pm$ 10.5

Age of participants changes between 24-48 and their mean age is found 28.4. Participants have worked between 1-25 years and the mean years working is found 4.3. The working hours/day for participants are ranged between 8-12 and the mean of it is found 8.5 hrs/day. The weight of participants is ranges between 50-120 kgs whereas the height of participants ranges between 150-195 cms. The mean score for weight is found 73.2 cms and the height of participants is found 170.3 cm.

4.1.2. Frequency of Gender

The frequency of females and males' gender is show below in table 4.1.2.

Table 3. Frequency of Gender

Gender	Frequency	Percentage (%)
--------	-----------	----------------

Female	18	60%
Male	12	40%
Total	30	100%

The Percentage of participant's gender distribution were 18 Females (60%) and 12 Males (40%).

4.1.3. Frequency of Musculoskeletal Symptoms

Table 4. Frequency of Musculoskeletal Symptoms

Musculoskeletal symptoms	Frequency	Percentage (%)
No symptoms	2	6.7%
Symptoms	28	93.3%

The frequency of musculoskeletal discomfort/pain was 93.3% which included 28 participants whereas the remaining 6.7% were from the 2 participants who had no discomfort/pain in any area of the body.

4.1.4. Values of WHOQOL-BREF Domains

Table 5. Values of WHOQOL-BREF Results.

WHOQOL-BREF Domains	minimum	maximum	mean	Standard Deviation ($\pm$ SD)
Physical Health	31	100	63.4	$\pm$ 19.301
Psychological Health	44	88	67.67	$\pm$ 12.430
Social Relationships	31	100	64.13	$\pm$ 22.288
Environment	31	100	69.33	$\pm$ 18.291

Regarding the interpretation of the WHOQOL-BREF results, it consists of 4 domains each one for a different aspect in life. All scores are out of a 100, therefore the higher the score the better quality of life the subject has. The highest score of physical health domain is 100 and the minimum is 31 with the mean being 63.4. Also, the highest score in the psychological score is 88 with lowest being 44 and the mean is 67.67. Regarding social relationships and environment domains, both have a highest score of 100 and lowest score of 31 but, the mean of social relationships domain being 64.13 and the mean of environment domain being 69.33.

4.1.5. Frequency of Sleep Quality in PSQI

Table 6. Frequency of Sleep Quality.

PSQI sleep quality	Frequency (f)	Percentage (%)
Good sleep	10	33.3%
Poor sleep	20	66.7%
Total	30	100%

In the Pittsburgh Sleep Quality Index, a score of less than or equal to 5 means good sleep and a score of more than 5 means poor sleep. The frequency of good sleep was 10 subjects (33.3%) and for poor sleep having a frequency of 20 subjects (66.7%) indicating that the incidence of poor sleep is exactly double that of good sleep in laboratory technicians.

Table 7. PSQI scores.

Value	Minimum	Maximum	Mean	$\pm$ sd
Sleep quality (PSQI)	3	15	7.3	$\pm$ 3.2605

The minimum score of the PSQI in this study was 3 while the maximum score was 15 with a final mean of 7.3 and a standard deviation of $\pm$ 3.2605.

4.1.6. Frequency of Physical Activity Levels from IPAQ

Table 8. Frequency of physical activity levels.

Physical activity level	Frequency (f)	Percentage (%)
Low	8	26.7%
Moderate	13	43.3%
High	9	30%
Total	30	100%

The frequency of level of physical activity was 8 subjects (26.7%) for low activity level, 13 subjects (43.3%) for moderate activity level and 9 subjects (30%) having high activity level.

4.2. Research Findings

4.2.1. NMQ Values

Table 9. NMQ detailed results.

Body part	Pain / Discomfort F (%)		Prevented from doing work anywhere F (%)		Trouble in the last 7 days F (%)	
	YES	NO	YES	NO	YES	NO
Neck	16 (53.3%)	14 (46.7%)	9 (56.3%)	7 (43.8%)	13 (81.3%)	3 (18.8%)
Shoulders	16 (53.3%)	14 (46.7%)	6 (37.5%)	10 (62.5%)	11 (68.8%)	5 (31.3%)
Elbows	1 (3.3%)	29 (96.7%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)
Wrists/ Hands	14 (46.7%)	16 (53.3%)	9 (64.3%)	5 (35.7%)	12 (85.7%)	2 (14.3%)
Upper back	12 (40%)	18 (60%)	4 (33.3%)	8 (66.7%)	8 (66.7%)	4 (33.3%)

Lower back	10 (33.3%)	20 (66.7%)	2 (20%)	8 (80%)	8 (80%)	2 (20%)
One or both hips/thighs	1 (3.3%)	29 (96.7%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
One or both knees	3 (10%)	27 (90%)	1 (33.3%)	2 (66.7%)	2 (66.7%)	1 (33.3%)
One or both ankles/feet	2 (6.7%)	28 (93.3%)	1 (50%)	1(50%)	2 (100%)	0 (0%)

The table above describes more specifically the frequency of pain/discomfort in areas of the body of the 28 subjects (93.3%) with musculoskeletal symptoms. Out of the 28 subjects, 16 (53.3%) had symptoms of neck pain with 9 being prevented from doing work and 13 having pain in the last 7 days. 16 (53.3%) out of the 28 have shoulder pain with 6 being prevented to do work and 11 having pain in the last 7 days. Only 1 (3.3%) subject from the 28 had elbow pain that also prevented them from doing work and had pain in the last 7 days. 14 (46.7%) of the 28 subjects have wrists/hands pain with 9 of them being prevented from doing work and 12 having pain in the last 7 days. 12 subjects (40%) have upper back pain with 4 of them being prevented to do work and 8 having pain in the last 7 days. 10 (33.3%) subjects have pain in the lower back with 2 of them being prevented from doing work and 8 having pain in the last 7 days. Only 1 (3.3%) subject has hips/thighs pain that doesn't prevent them from doing work but had pain in the last 7 days. 3 (10%) subjects have knee pain with only 1 being prevented from doing work and 2 having pain in the last 7 days. Finally, 2 (6.7%) subjects have ankles/feet pain with 1 being prevented from doing work and 2 having symptoms in the last 7 days.

Therefore, as these results interpreted, the area with the most musculoskeletal pain/symptoms is the neck and shoulders with the wrists/hands in the second most prevalent area.

4.2.2. WHOQOL-BREF Values According to Musculoskeletal Symptoms

Musculoskeletal symptoms	WHOQOL-BREF Domains	Minimum	Maximum	Mean $\pm$sd
NO PAIN N=2	Physical health	81	94	87.5 $\pm$ 9.2
	Psychological	81	81	81 $\pm$ 0
	Social relationships	56	75	65.5 $\pm$ 13.4
	Environment	50	75	62.5 $\pm$ 17.7
PAIN N= 28	Physical health	31	100	61.7 $\pm$ 18.7
	Psychological	44	88	66.7 $\pm$ 12.3
	Social relationships	31	100	64 $\pm$ 23
	Environment	31	100	69.8 $\pm$ 18.5

Table 10. WHOQOL-BREF values according to musculoskeletal symptoms.

The WHOQOL-BREF consists of four domains interpreting the quality of life in each aspect in one's life. The result for each domain is out of 100 and the higher the result, the better the quality of life. The pain and no pain group could not be compared or correlated due to there being only 2 subjects with no musculoskeletal symptom/pain. Looking at the results of the subjects with musculoskeletal symptoms/pain alone, it shows that the mean of each domain was more than 50 out of a hundred with the mean of physical health being 61.7, the psychological mean 66.7, the social relationships mean being 64 and environment mean being 69.8 from 100. Below is a table that divides the WHOQOL-BREF results into low which is a score less or equal to 50 and a score of high which is more than 50. In physical health domain, only 10 from 28 had a low score, in psychological

domain only 4 had a low score, in social relationships domain only 9 had a low score and in environment domain only 6 had a low score.

Table 11. frequency of WHOQOL-BREF values with presence of musculoskeletal symptoms.

Subjects with musculoskeletal symptoms (n=28)	WHOQOL-BREF domain	Score ≤ 50 LOW F(%)	Score > 50 HIGH F(%)
	Physical Health	10 (35.71%)	18 (64.29%)
	Psychological	4 (14.29%)	24 (85.71%)
	Social relationships	9 (32.1%)	19 (67.9%)
	Environment	6 (21.4%)	22 (78.6%)

4.2.3. PSQI Values According to Musculoskeletal Symptoms

Table 12 PSQI values according to musculoskeletal symptoms.

Musculoskeletal symptom	PSQI score minimum	PSQI score maximum	PSQI score mean $\pm$ sd
No pain	3	4	3.5 $\pm$ 0.7
pain	3	15	7.6 $\pm$ 3.2

The sleep quality was measured for subjects with pain (n=28) and subjects with no pain (n=2). A score of less than or equal to 5 is an identification of good sleep quality, while a score of more than 5 means poor sleep quality. The mean PSQI score for subjects with pain is 7.6 and the mean for PSQI with subject with no pain is 3.5. These two groups can't be compared since the subjects with no pain are only 2 compared to those with pain which are 28.

Table 13. Frequency of poor and good sleep quality.

Musculoskeletal symptom	Poor sleep quality (>5)	Good sleep quality (≤ 5)

Pain (n=28)	20	8
Percentage (%)	71.43%	28.57%

In relation to musculoskeletal pain/symptoms, the number of subjects with pain (28) that have poor sleep quality is 20 (71.43%) while the number of subjects that have good sleep quality is 8 (28.57%). Therefore, according to these results it could be said that people with musculoskeletal pain/symptoms are more likely to have poor sleep quality.

4.2.4. IPAQ Values According to Musculoskeletal Symptoms

Table 14. IPAQ values according to musculoskeletal symptoms.

Variables	Low		Moderate		High	
	No Pain	Pain	No Pain	Pain	No Pain	Pain
	f(%)	f(%)	f(%)	f(%)	f(%)	f(%)
Musculoskeletal pain/symptoms 28	0(0)	8(100)	0(0)	13(100)	2(22,2)	7(77,8)
Neck 16	2(25)	6(75)	6(46,2)	7(53,8)	6(66,7)	3(33,3)
Shoulder 16	4(50)	4(50)	5(38,5)	8(61,5)	5(55,6)	4(44,4)
Elbows 1	7(87,5)	1(12,5)	13(100)	0(0)	9(100)	0(0)
Wrists Hands 14	3(37,5)	5(62,5)	6(46,2)	7(53,8)	7(77,8)	2(22,2)
Upper back 12	3(37,5)	5(62,5)	7(53,8)	6(46,2)	8(88,9)	1(11,1)
Lower back 10	5(62,5)	3(37,5)	9(69,2)	4(30,8)	6(66,7)	3(33,3)
Hips Thighs 1	8(100)	0(0)	12(92,3)	1(7,7)	9(100)	0(0)
Knees 3	7(87,5)	1(12,5)	11(84,6)	2(15,4)	9(100)	0(0)
Ankles Feet 2	8(100)	0(0)	11(84,6)	2(15,4)	9(100)	0(0)

The IPAQ is divided into 3 groups, low physical activity (n=8), moderate physical activity (n=13) and high physical activity (n=9). 100% of the low activity subjects have a musculoskeletal symptom/pain. Also, 100% of the moderate physical activity group have musculoskeletal symptom/pain. Finally, the high physical activity group consists of 77.8% of subjects with musculoskeletal symptom/pain and 22.2% of subjects with no musculoskeletal symptom/pain making it the only physical activity group with subjects showing no musculoskeletal symptoms/pain (n=2).

Out of the 16 subjects with neck symptoms, 6 had low physical activity, 7 moderate activity and 3 high physical activity. 16 subjects with shoulder symptoms, 4 had low physical activity, 8 moderate and 4 high physical activity. The one subject with elbow symptoms had low physical activity. For the 14 subjects who had wrists/hands symptoms, 5 had low physical activity, 7 moderate physical activity and 2 had high physical activity. The 12 subjects with upper back symptoms, 5 had low physical activity, 6 moderate physical activity and 1 had high physical activity. The 10 subjects with low back symptoms, 3 had low physical activity, 4 had moderate physical activity and 3 had high physical activity. The one subject with hip/thighs symptoms had moderate physical activity. The 3 subjects with knee symptoms, 1 had low physical activity and 2 had moderate physical activity. Finally, the 2 subjects with ankles/feet symptoms had moderate physical activity.

4.2.5. WHOQOL-BREF, PSQI and MET Values Compared to Physical activity Levels

Table 15. Quality of life, sleep quality and METs values compared to physical activity.

Variable	¹ Low (f=8)	² Moderate (f=13)	³ High (f=9)	Significance p	Difference **
	Mean ±sd	Mean ±sd	Mean ±sd		
Sleep quality	9,5±4,2	6,7±2,1	6,2±3,1	0,194*	
Physical Health	52,5±16	58,8±18	79,8±13,5	0,007*	3 and 1,2
Psychological	57,1±7,9	69,9±13,7	73,8±8	0,008*	1 and 2,3
Social Relationships	60,9±25,6	67,8±22,1	61,8±21,3	0,704*	

Environment	55,4±22,6	74,9±15,2	73,8±12,4	0,132*	
MET-min/week total	270,4±153, 5	1227,8±732, 9	4925,8±3349, 1	,000*	1,2 and 3

*Significant value for Kruskal Wallis; ** Mann-Whitney U result

The subjects' sleep quality, physical health, psychological, social relationships, environment and MET-min/week total scores were compared according to their physical activity level by using the Kruskal-Wallis analysis method, a non-parametric method. It is used as an alternative way of one-way analysis of variance. Since the sample size in each group of physical activity level is not enough, Kruskal-Wallis analysis method was used.

It is found that participants' physical health, psychological and MET-min/week total scores differed statistically significant between the groups of physical activity level ($p<.05$). Whether there is a difference between which groups of physical activity levels is compared by using Mann-Whitney U analysis method and are shown at the difference column for Table 14.

Physical health scores of participants who have high physical activity level is higher than scores of participants who have low and moderate physical activity level ($p<.05$). Psychological scores of participants who have high and moderate physical activity level is higher than scores of participants who have low physical activity level ($p<.05$). MET-min/week total scores of participants who have high physical activity level is higher than scores of participants who have low and moderate physical activity level ($p<.05$).

Moreover, MET-min/week total scores of participants who have moderate physical activity level is higher than scores of participants who have low physical activity level ($p<.05$). Participants' physical sleep quality, social relationships and environment scores didn't differ statistically significant between the groups of physical activity level ($p>.05$). Therefore, it could be said that the higher the physical activity level the better physical health and psychological health in the Quality of life.

4.2.6. Relationship Between All Variable Scores

Table 16. relationship between all variable scores.

Variables	1	2	3	4	5	6
1. Sleep quality	1					
2. Physical Health	-0,36	1				
3. Psychological	-,452*	,713**	1			
4.Social Relationships	-0,204	-0,042	0,332	1		
5. Environment	-0,148	,468**	,437*	0,186	1	
6.MET-min/week total	-0,189	,431*	,362*	-0,015	0,205	1
*p<.05; **p<.01						

There is significantly mediate and negative relationship between sleep quality and psychological scores ($r=-0.452$, $p<.05$). As sleep quality increases, psychological scores decrease. There is significantly strong and positive relationship between physical health and psychological scores ($r= 0.713$, $p<.01$). Both physical health and psychological scores increase or decrease in the same direction. There is significantly mediate and positive relationship between physical health and environment ($r=0.468$, $p<.01$) and MET-min/week total scores ($r=0.431$, $p<.05$). As physical health scores increase, environment and MET-min week total scores also increases. There is significantly mediate and positive relationship between psychological and environment ($r=0.437$, $p<.05$) whereas low and positive relationship between psychological and MET-min week total scores ($r=0.362$, $p<.05$). As psychological scores increase, environment and MET-min week total scores also increases.

5. DISCUSSION AND CONCLUSION

The aim of this study was to evaluate musculoskeletal pain/symptoms and its effect on the quality of life, sleep quality and physical activity in COVID-19 laboratory technicians. We hypothesized that there would be a high prevalence of musculoskeletal pain/symptoms in COVID-19 laboratory technicians.

To our knowledge this was the first study to evaluate COVID-19 laboratory technicians specifically and the effects of musculoskeletal pain/symptoms on the quality of life, sleep quality and physical activity. According to the statistical analysis, the hypothesis of this study was proven. The main results of the study showed that 93.3% of COVID-19 laboratory technicians suffer from musculoskeletal symptoms/pain which indicates the prevalence of musculoskeletal symptoms being very high. Similar results were shown in previous studies by Alnekhilan et al. with 82% of laboratory technicians having musculoskeletal symptoms, Gul et al. having 62.5% of Tuberculosis laboratory technicians with musculoskeletal symptoms and Maulik et al. having 79.6% of laboratory technicians having musculoskeletal symptoms. (36,39,91)

Additionally, the most affected body parts were in the neck and shoulders (53.3%) then the wrists/hands (46.7%), upper back (40%) and lower back (33.3%). The less common areas with musculoskeletal symptoms were the knees, ankles/feet, hips/thighs and elbows. These results were previously shown in a study by González et al. which showed that 84.5% of the laboratory technician sample having musculoskeletal symptoms with most commonly in neck, shoulder and wrists. (92)

Lower limb musculoskeletal symptoms were less prevalent in this study in the hips/thighs, knees and ankles/feet with a prevalence rate of 3.3 % to 10% compared to previous literature with 10-20% prevalence rate. (93,94) (95)

None of the previously mentioned studies were conducted specifically on COVID-19 laboratory technicians but rather by other types of laboratory technicians like tuberculosis or oncology departments.

The high prevalence of musculoskeletal symptoms in this study could be likely linked to the long working hours of 8-12 hours during the pandemic as it is required for the laboratory to be working 24/7 with laboratory technicians working in 3 shifts to cover

the whole day which is consistent with previous studies that also indicate an increase in WMSDs with long working hours. (96) The link between long working hours and the hazard of WMSDs can be clarified by the theory that as working hours increase, so does time subjected to physical strain at work, which may affect the higher prevalence of musculoskeletal diseases. Aside from the ergonomic element, an increase in working hours could perhaps result in a subsequent decrease in recovery time from cumulative fatigue and free time to alleviate stress. (97)

Another reason for the high number of musculoskeletal symptoms could also be related to the use of repetitive motions as the COVID-19 technicians spend most of the testing time pipetting repetitively and their awkward posture with long hours of standing. This repetitive motion of pipetting has been previously proven to cause musculoskeletal symptoms in other researches. (41,93)

Due to the low number of subjects with no musculoskeletal symptoms/pain, no comparison could be done with the group with musculoskeletal symptoms/pain. But, according to the results of our study in the Quality of life aspect the subjects with musculoskeletal symptoms (93.3%) only 35.7% scored less than 50 on the physical health domain of the WHOQOL-BREF, 14.3% scored less than 50 on the psychological domain, 32.1% scored less than 50 on the social relationship domain and only 21.4% scored less than 50 on the environment domain. Due to the inability to compare our scores to the subjects with no musculoskeletal symptoms we cannot say for a fact that musculoskeletal symptoms have small or no effect on the Quality of life but in fact, it did affect some of the subjects mostly in the physical health domain which could be due to the inability to perform exercise, long working hours, stress or decreased rest. In our inter relation results between the Quality of life domains it was seen than an increase in physical health domain was also related to an increase in the environment domain and vice versa which is because an increase in environmental domain means an increase in financial resources, freedom, healthcare accessibility and more which will certainly have a positive impact on a person's physical health. Also, a positive relationship between psychological domain scores and environment domain scores was seen, as one increases the other also increases which also could be due to the environment domain consisting of financial resources, safety, good home environment and healthcare accessibility which infact have a big toll on the psychological wellbeing of the subjects.

Although no previous studies measured the quality of life of laboratory technicians alone, previous studies that measured the quality of life of healthcare workers concluded that they have a low quality of life. In a 2020 study by Suryavanshi et al., it was shown that 49% of healthcare workers in their study had low quality of life. (98) A study by Korkmaz et al. evaluating COVID-19 healthcare workers concluded that Anxiety and sleep disorders are common psychiatric illnesses among healthcare workers and that such symptoms may impair healthcare workers' problem-solving abilities and reduce their overall quality of life. (99)

The Quality of life results of our study showed an average mean in relation to musculoskeletal symptoms/pain. In our opinion these results could be greatly improved by the reduction of symptoms. This relationship has been previously seen in literature where the quality of life was correlated to low back pain in nurses consequently affecting work output and social life. (100,101)

Our study shows there's an increased risk of poor sleep when there are musculoskeletal symptoms. Our results showed that 71.43% of laboratory technicians with musculoskeletal symptoms/pain have poor sleep quality while the remaining 28.57% had good sleep quality. This proves that musculoskeletal symptoms/pain does indeed affect the sleep quality. Although there are no previous studies assessing sleep quality in laboratory technicians in any setting, a previous study evaluating healthcare workers showed that 42.3% of their subjects had poor sleep which was plenty and they also found that poor sleepers also had stressful job settings. (102) Stress can play a role in so many aspects of life whether it be physical or emotional. A study conducted on hospital workers showed that the more stressed the subject was the poorer their quality of sleep and also, the more musculoskeletal pain/symptoms the poorer the quality of sleep. (72) Researchers found that another contribution to musculoskeletal pain/symptoms could be the sleep duration, where too much or too little sleep can indeed effect pain in a negative way. (71) In dentists with high risk of musculoskeletal pain/symptoms, a study showed that there was a high prevalence of pain associated with poor sleep quality and multi-site pain. (103)

In this study, There was no significant relationship between the sleep quality in laboratory technicians and their quality of life in most of the domains except for the psychological domain. As sleep quality increased, the psychological quality of life of the

subject decreased, this could be explained by having some subjects with psychological problems such as depression who could be using sleep as a coping mechanism and that's why they usually have long sleeping hours which was previously proven by Patel et. Al. (104) Another study showed that the better the sleep quality the better the quality of life in nurses and that work related musculoskeletal disorders resulted in poorer physical health, psychological health, social relationships and environment domains in the quality of life and that physical activity greatly improved physical and psychological health domains in quality of life which we have also seen in our study. (105)

The stressful situation of the pandemic with the worry of the laboratory technicians for their and their family's safety could largely affect their quality of life and sleep quality. The insufficient amount of healthcare workers made it hard for subjects to leave when they felt overwhelmed or felt like they needed rest. This could largely affect the presence of musculoskeletal symptoms/pain. The quality of sleep could in fact worsen the psychological aspect of someone's life. A previous study shows that poor sleep quality and quality of life resulted in increased anxiety and depressive symptoms in healthcare professionals. (106)

Having musculoskeletal pain/symptoms can greatly impact anyone's daily activities as it causes severe mental and physical stress. The amount of work a person could do would be affected and therefor decreasing it which was seen in a previous study where patients with musculoskeletal pain/symptoms regularly state a decrease in daily function from pain. (107) Physical activity is one part that pain could affect by decreasing it and that's why our results showed that only 25% of laboratory technicians with musculoskeletal symptoms have high physical activity levels, 46.5% having moderate levels and 28.5% having low levels. This could also be due to the fact that they don't have enough time to exercise, stress from work requiring them to rest or having other responsibilities after work and some are even studying.

Physical activity is important in everyone's day to day life as it allows not only for physical healing but also mental and in preventing injuries. It was also shown that more than 75 minutes per week of vigorous physical activity is related to lower levels of musculoskeletal pain/symptoms in neck and shoulders. (108) Physical activity is also shown to be a non-pharmacological choice for the treatment of musculoskeletal

pain/symptoms. (109) A study by Guddal et al. discovered that moderate physical activity level was correlated with lower shoulder, neck and low back pain. (110) that's why it is very important to implement daily physical activity at the work site where it is compulsory for everyone to follow in order to reduce the pain and possible disability due to musculoskeletal symptoms as previously proven in other studies where it also showed improvement in short and medium terms in clinical populations. (111–113) It has also been proven that workplace exercise is much better than the home based ones as it increases muscle strength, decreases use of medicine and decreases musculoskeletal pain/symptoms in healthcare workers. (75)

Our results prove that physical activity has a positive effect on physical health and psychological domains in the subject's quality of life. Where subjects with high physical activity levels showed higher scores in both physical health and psychological domains. This has been previously seen in research. (114)(105) with decreasing psychological stress, this will infact affect the presence of musculoskeletal pain/symptoms, resulting in decreasing it as shown before in studies. (115)

Most healthcare workers are not educated about the importance of following up with a physical therapist when musculoskeletal pain/symptoms arises. (116) Seeing a physical therapist as soon as symptoms start could greatly affect the outcome. (117)

Our study shows that there is a huge problem in dealing with musculoskeletal pain/symptoms in healthcare environments especially regarding laboratory technicians. More focus should be put on education to prevent the occurrence of such symptoms that could turn to future disabilities. The presence on at work exercise and physical therapy could very much improve their work outcome by improving both mental and physical health as well as allowing for more rest time for healing.

Although our sample size was small due to the precise choice of COVID-19 laboratory technicians and it was a cross-sectional design study, it remains true that laboratory technicians are put under severe mental and physical stress and that the consequences are heavy.

In conclusion, the presence of musculoskeletal pain/symptoms in COVID-19 laboratory technicians is high and it greatly effects sleep quality. Physical activity was shown to improve results of quality of life in psychological and physical health domains. More education and intervention are needed to prevent the occurrence of work-related musculoskeletal pain/symptoms.



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7. APPENDICES

7.1 APPENDIX 1.Ethical Committee Approval



YEDİTEPE UNIVERSITY
NON-INTERVENTIONAL CLINICAL RESEARCH ETHICS BOARD

Version No 2.0

Feb.13, 2022

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DECISION FORM

April 27, 2022

ETHICAL BOARD CONTACT INFORMATION	Name	Yeditepe University Non-Interventional Clinical Research Ethics Board
	Address	Yeditepe Üniversitesi Kayışdağı Kampüsü, Tıp-Mühendislik Binası, Sağlık Bilimleri Enstitüsü, İnönü Mah. Kayışdağı Cad. 326A, 26 Ağustos Yerleşimi 34755 Ataşehir, İstanbul
	Website	http://goetik.yeditepe.edu.tr/
	Phone	+90 216 578 00 00
	E-mail	goetik@yeditepe.edu.tr

EVALUATED DOCUMENTS	Application file original signatures, CD and online application	☒
	Title of research and the names of the researchers	☒
	Letter of application	☒
	Application Form-Nature of the Research;	☒
	• Type	☒
	• Significance and distinctive value	☒
	• Aims and objectives	☒
	• Method	☒
	• Management of the research	☒
	• Widespread impact	☒
	• Pertinence of the budget and reason (if applicable)	☒
	• Timeframe and convenience	☒
	• References	☒
	Informed consent form (uniquely prepared for the research)	☒
	Letter of Undertaking-1 A commitment to undertake the responsibility of obtaining institutions permission from where the data collection will be made	☒
	Letter of Undertaking-2 A commitment to read the latest version of the World Medical Association Declaration of Helsinki and all relevant guidelines of the Ministry of Health	☒
	Letter of Undertaking-3 A commitment on whether there are previous ethical board applications	☒
	Letter of Undertaking-4 A commitment that no action will be taken during the research that is not included in the research budget and that will bring additional burden to the volunteer or the Social Security Institution	☒
	Letter of Undertaking-5 A commitment to reading the circular on treatment approaches and scientific research in COVID-19 patients	☒
	Letter of Undertaking-6 A commitment to reading the document of Research Application Permissions that is published by Ministry of Education	☒
	'Resume Forms' filled separately by all the researchers and signed.	☒
	Additional documents (Scale permissions used, if any, etc.)	☒

DECISION DETAILS	Application Number	202203Y0203
	Meeting Date	11.03.2022
	Meeting Place	Online (Google Meet)
	Decision No.	18

Research Title	Evaluation of Musculoskeletal Pain and Its Effect On Quality of Life , Sleep Quality and Physical Activity on Covid – 19 Lab Technicians
Researchers	Al-Assar S. , Prof. Dr. Rasmi Muammer



APPLICATION NUMBER: 202203Y0203

April 27, 2022

DECISION

☒ APPROVED	☐ REJECTED ☐ OUT OF SCOPE (THE SCOPE OF THE STUDY WAS NOT WITHIN LIMITS OF THIS ETHICS BOARD) ☐ AGAINST SCIENTIFIC AND/OR ETHICAL RULES ☐ THERE ARE MORE THAN TWO (2) SUBMISSIONS WITH THE SAME PRINCIPAL INVESTIGATOR ☐ THE ELECTRONIC SUBMISSION IS NOT PERFORMED VIA AN INSTITUTIONAL EMAIL ACCOUNT ☐ ASKED REVISIONS ARE NOT PERFORMED APPROPRIATELY AND/OR ON TIME
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On behalf of Yeditepe University Non-Interventional Clinical Research Ethics Board
Prof. Dr. Didem ÖZDEMİR ÖZENEN
Chair

Research Title	Evaluation of Musculoskeletal Pain and Its Effect On Quality of Life , Sleep Quality and Physical Activity on Covid – 19 Lab Technicians
Researchers	Al-Assar S. , Prof. Dr. Rasmi Muammer

7.2 APPENDIX 2. Laboratory Permission



DIVISION OF CERBA HEALTHCARE



DATE: 15th January 2022

Re: Sally Al-Assar

I, Dr. Dina El Khashab give the permission to Sally Al-Assar Holder USA passport No. 488424619 to conduct her research with the topic of "Evaluation of musculoskeletal pain and its effect on quality of life, sleep quality and physical activity on Covid-19 lab technicians" at MENA laboratory as part of her Masters thesis at Yeditepe university.

MenaLabs Medical Laboratories
Abu Dhabi – Ajman – Al Ain
Dubai – Ras Al Khaima – Sharjah

UAE Toll Free Number
800 MenaLabs (63 62 52 22)

403, Bel Rashed Business Tower 1, Buhaira
Sharjah, United Arab Emirates
Tel: +9736 575 4579

7.3 APPENDIX 3. Consent Form

RESEARCH ETHICS: SAMPLE CONSENT FORM

Form RE5

Full title of Project: Evaluation of musculoskeletal pain/symptoms and its effect on quality of life, sleep quality and physical activity on Covid-19 lab technicians.

Name of Researcher: SALLY AL-ASSAR

Please Initial Box

- | | | |
|----|--|--------------------------|
| 1. | I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | ☐ |
| 2. | I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason. | ☐ |
| 3. | I agree to take part in the above study. | ☐ |

Name of Participant

Date

Signature

Name of Researcher

Date

Signature

L:\AQAS\Common\Research\Research Ethics\Sample Consent Form RE5.doc

7.4 APPENDIX 4. Demographic Information Questionnaire

Date:

Demographic information questionnaire

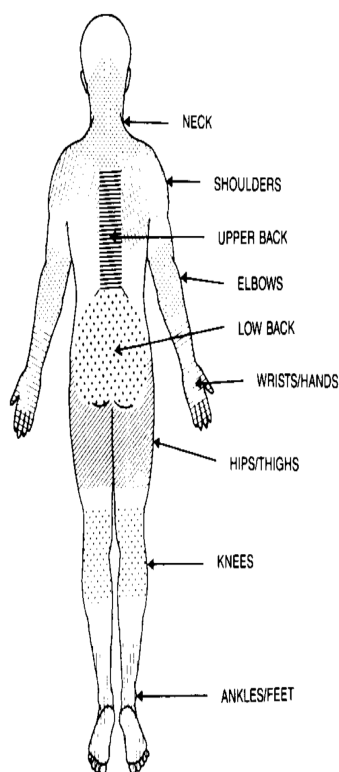
Name:

1. Gender ☐ Male ☐ Female
2. What is your age? _____
3. Marital status ☐ Single ☐ Married
4. What is your weight?
5. What is your height?
6. What is your current job title?
7. How many years have you been working as a lab technician?
8. How many working hours per day?
9. Have you had any chronic illnesses in the past 10 years?

7.5 APPENDIX 5. Nordic Musculoskeletal Questionnaire (NMQ)

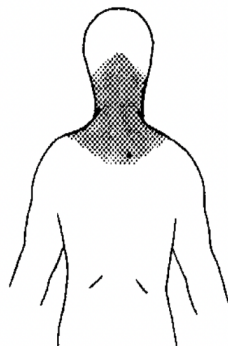
How to answer the questionnaire:

Please answer by putting a cross in the appropriate box — one cross for each question. You may be in doubt as to how to answer, but please do your best anyway. Please answer every question, even if you have never had trouble in any part of your body.



In this picture you can see the approximate position of the parts of the body referred to in the questionnaire. Limits are not sharply defined, and certain parts overlap. You should decide for yourself in which part you have or have had your trouble (if any).

Trouble with the locomotive organs											
				To be answered only by those who have had trouble							
Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in:				Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?		Have you had trouble at any time during the last 7 days?					
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes
Neck											
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes
Shoulders											
1	No	2	Yes, in the right shoulder	1	No	2	Yes	1	No	2	Yes
		3	Yes, in the left shoulder								
		4	Yes, in both shoulders								
Elbows											
1	No	2	Yes, in the right elbow	1	No	2	Yes	1	No	2	Yes
		3	Yes, in the left elbow								
		4	Yes, in both elbows								
Wrists/hands											
1	No	2	Yes, in the right wrist/hand	1	No	2	Yes	1	No	2	Yes
		3	Yes, in the left wrist/hand								
		4	Yes, in both wrists/hands								
Upper back											
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes
Low back (small of the back)											
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes
One or both hip/thighs											
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes
One or both knees											
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes
One or both ankles/feet											
1	No	2	Yes	1	No	2	Yes	1	No	2	Yes



NECK

How to answer the questionnaire: By neck trouble is meant ache, pain or discomfort in the shaded area. Please concentrate on this area, ignoring any trouble you may have in adjacent parts of the body. There is a separate questionnaire for shoulder trouble.

Please answer by putting a cross in the appropriate box — one cross for each question. You may be in doubt as to how to answer, but please do your best anyway.

1. Have you **ever** had neck trouble (ache, pain or discomfort)?

1 ☐ No 2 ☐ Yes

If you answered **No** to Question 1, do not answer the questions 2—8.

2. Have you **ever** hurt your neck in an **accident**?

1 ☐ No 2 ☐ Yes

3. Have you **ever** had to change jobs or duties because of neck trouble?

1 ☐ No 2 ☐ Yes

4. What is the **total** length of time that you have had neck trouble during the **last 12 months**?

1 ☐ 0 days
2 ☐ 1—7 days
3 ☐ 8—30 days
4 ☐ More than 30 days, but not every day
5 ☐ Every day

If you answered **0 days** to Question 4, do not answer the questions 5—8.

5. Has neck trouble caused you to **reduce** your activity during the **last 12 months**?

a. Work activity (at home or away from home)?

1 ☐ No 2 ☐ Yes

b. Leisure activity?

1 ☐ No 2 ☐ Yes

6. What is the **total** length of time that neck trouble has prevented you from doing your normal work (at home or away from home) during the **last 12 months**?

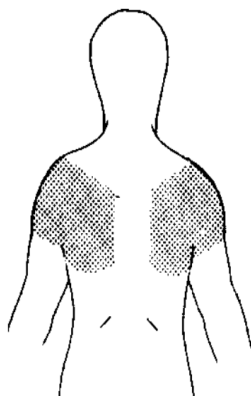
1 ☐ 0 days
2 ☐ 1—7 days
3 ☐ 8—30 days
4 ☐ More than 30 days

7. Have you **been seen** by a doctor, physiotherapist, chiropractor or other such person because of neck trouble during the **last 12 months**?

1 ☐ No 2 ☐ Yes

8. Have you had neck trouble at any time during the **last 7 days**?

1 ☐ No 2 ☐ Yes



SHOULDER

How to answer the questionnaire: By shoulder trouble is meant ache, pain or discomfort in the shaded area. Please concentrate on this area, ignoring any trouble you may have in adjacent parts of the body. There is a separate questionnaire for neck trouble.

Please answer by putting a cross in the appropriate box — one cross for each question. You may be in doubt as to how to answer, but please do your best anyway.

9. Have you **ever** had shoulder trouble (ache, pain or discomfort)?
- 1 ☐ No 2 ☐ Yes

If you answered **No** to Question 9, do not answer the questions 10—17.

10. Have you **ever** hurt your shoulder in an **accident**?
- 1 ☐ No 2 ☐ Yes, my right shoulder
3 ☐ Yes, my left shoulder
4 ☐ Yes, both shoulders

11. Have you **ever** had to **change jobs or duties** because of shoulder trouble?
- 1 ☐ No 2 ☐ Yes

12. Have you had shoulder trouble during the **last 12 months**?
- 1 ☐ No 2 ☐ Yes, in my right shoulder
3 ☐ Yes, in my left shoulder
4 ☐ Yes, in both shoulders

If you answered **No** to Question 12, do not answer the questions 13—17.

13. What is the **total** length of time that you have had shoulder trouble during the **last 12 months**?
- 1 ☐ 1—7 days
2 ☐ 8—30 days
3 ☐ More than 30 days, but not every day
4 ☐ Every day

14. Has shoulder trouble caused you to **reduce** your activity during the **last 12 months**?

a. Work activity (at home or away from home)?

- 1 ☐ No 2 ☐ Yes

b. Leisure activity?

- 1 ☐ No 2 ☐ Yes

15. What is the **total** length of time that shoulder trouble has **prevented** you from doing your normal work (at home or away from home) during the **last 12 months**?

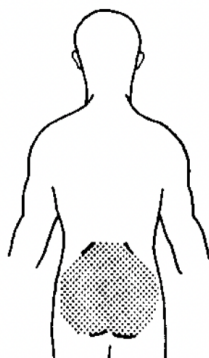
- 1 ☐ 0 days
2 ☐ 1—7 days
3 ☐ 8—30 days
4 ☐ More than 30 days

16. Have you **been seen** by a doctor, physiotherapist, chiropractor or other such person because of shoulder trouble during the **last 12 months**?

- 1 ☐ No 2 ☐ Yes

17. Have you had shoulder trouble at any time during the **last 7 days**?

- 1 ☐ No 2 ☐ Yes, in my right shoulder
3 ☐ Yes, in my left shoulder
4 ☐ Yes, in both shoulders



LOW BACK

How to answer the questionnaire: In this picture you can see the approximate position of the part of the body referred to in the questionnaire. By low back trouble is meant ache, pain or discomfort in the shaded area whether or not it extends from there to one or both legs (sciatica).

Please answer by putting a cross in the appropriate box — one cross for each question. You may be in doubt as to how to answer, but please do your best anyway.

1. Have you **ever** had low back trouble (ache, pain or discomfort)?

1 ☐ No 2 ☐ Yes

If you answered **No** to Question 1, do not answer questions 2—8.

2. Have you **ever** been hospitalized because of low back trouble?

1 ☐ No 2 ☐ Yes

3. Have you **ever** had to change **jobs or duties** because of low back trouble?

1 ☐ No 2 ☐ Yes

4. What is the **total** length of time that you have had low back trouble during the **last 12 months**?

- 1 ☐ 0 days
- 2 ☐ 1—7 days
- 3 ☐ 8—30 days
- 4 ☐ More than 30 days, but not every day
- 5 ☐ Every day

If you answered **0 days** to question 4, do not answer the questions 5—8.

5. Has low back trouble caused you to **reduce** your activity during the **last 12 months**?

a. Work activity (at home or away from home)?

1 ☐ No 2 ☐ Yes

b. Leisure activity?

1 ☐ No 2 ☐ Yes

6. What is the **total** length of time that low back trouble has **prevented** you from doing your normal work (at home or away from home) during the **last 12 months**?

- 1 ☐ 0 days
- 2 ☐ 1—7 days
- 3 ☐ 8—30 days
- 4 ☐ More than 30 days

7. Have you **been seen** by a doctor, physio-therapist, chiropractor or other such person because of low back trouble during the **last 12 months**?

1 ☐ No 2 ☐ Yes

8. Have you had low back trouble at any time during the **last 7 days**?

1 ☐ No 2 ☐ Yes

7.5.1 Permission to use NMQ

permission to use NMQ

External Inbox x

^ v



SALLY AL-ASSAR Thu, Mar 31, 9:09 PM (14 hours ago) ☆

good evening, my name is sally al-assar and i am currently conducting a research study f...



Turhan Kahraman 9:51 AM (2 hours ago) ☆ ↩ ⋮

to me ▾

Dear Sally,

You can use the Turkish version of NMQ without any permission as long as you cite the Turkish validation study. I am sending the Turkish version of NMQ, reporting recommendation, and Turkish validation study.

Good luck with your thesis.

Turhan

--

Doç. Dr. Turhan Kahraman
İzmir Kâtip Çelebi Üniversitesi
Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Bölümü
35620, Çiğli, İzmir, Türkiye | +90 232 329 35 35 - 4834
turhan.kahraman@ikcu.edu.tr | www.ikcu.edu.tr

7.6 APPENDIX 6. WHOQOL-BREF Questionnaire

WHOQOL-BREF

The following questions ask how you feel about your quality of life, health, or other areas of your life. I will read out each question to you, along with the response options. **Please choose the answer that appears most appropriate.** If you are unsure about which response to give to a question, the first response you think of is often the best one.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last four weeks**.

		Very poor	Poor	Neither poor nor good	Good	Very good
1.	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
2.	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last four weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
3.	To what extent do you feel that physical pain prevents you from doing what you need to do?	5	4	3	2	1
4.	How much do you need any medical treatment to function in your daily life?	5	4	3	2	1
5.	How much do you enjoy life?	1	2	3	4	5
6.	To what extent do you feel your life to be meaningful?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
7.	How well are you able to concentrate?	1	2	3	4	5
8.	How safe do you feel in your daily life?	1	2	3	4	5
9.	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

		Not at all	A little	Moderately	Mostly	Completely
10.	Do you have enough energy for everyday life?	1	2	3	4	5
11.	Are you able to accept your bodily appearance?	1	2	3	4	5
12.	Have you enough money to meet your needs?	1	2	3	4	5
13.	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14.	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

		Very poor	Poor	Neither poor nor good	Good	Very good
15.	How well are you able to get around?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16.	How satisfied are you with your sleep?	1	2	3	4	5
17.	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18.	How satisfied are you with your capacity for work?	1	2	3	4	5
19.	How satisfied are you with yourself?	1	2	3	4	5

20.	How satisfied are you with your personal relationships?	1	2	3	4	5
21.	How satisfied are you with your sex life?	1	2	3	4	5
22.	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23.	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24.	How satisfied are you with your access to health services?	1	2	3	4	5
25.	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to how often you have felt or experienced certain things in the last four weeks.

		Never	Seldom	Quite often	Very often	Always
26.	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	5	4	3	2	1

Do you have any comments about the assessment?

[The following table should be completed after the interview is finished]

		Equations for computing domain scores	Raw score	Transformed scores*	
				4-20	0-100
27.	Domain 1	$(6-Q3) + (6-Q4) + Q10 + Q15 + Q16 + Q17 + Q18$ $\square + \square + \square + \square + \square + \square + \square$	a. =	b:	c:
28.	Domain 2	$Q5 + Q6 + Q7 + Q11 + Q19 + (6-Q26)$ $\square + \square + \square + \square + \square + \square$	a. =	b:	c:
29.	Domain 3	$Q20 + Q21 + Q22$ $\square + \square + \square$	a. =	b:	c:
30.	Domain 4	$Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25$ $\square + \square + \square + \square + \square + \square + \square + \square$	a. =	b:	c:

* See Procedures Manual, pages 13-15

7.6.1 WHOQOL-BREF Permission

3/31/22, 9:30 PM

Yeditepe Üniversitesi Mail - ID: 388884 Permission authorization for WHO copyrighted material



SALLY AL-ASSAR <sally.al-assar@std.yeditepe.edu.tr>

ID: 388884 Permission authorization for WHO copyrighted material

1 message

Tue, Mar 29, 2022 at 7:45 PM

Dear Ms Al-Assar,

Thank you for submitting the online form and for your interest in World Health Organization (WHO) Quality of Life materials.

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Kind regards,
WHO Permissions team

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7.7 APPENDIX 7. Pittsburgh Sleep Quality Index Questionnaire (PSQI)

PITTSBURGH SLEEP QUALITY INDEX (PSQI)

INSTRUCTIONS: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, when have you usually gone to bed at night?
USUAL BED TIME _____
2. During the past month, how long (in minutes) has it usually take you to fall asleep each night?
NUMBER OF MINUTES _____
3. During the past month, when have you usually gotten up in the morning?
USUAL GETTING UP TIME _____
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)
HOURS OF SLEEP PER NIGHT _____

INSTRUCTIONS: For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
(a) ...cannot get to sleep within 30 minutes	☐	☐	☐	☐
(b) ...wake up in the middle of the night or early morning	☐	☐	☐	☐
(c) ...have to get up to use the bathroom	☐	☐	☐	☐
(d) ...cannot breathe comfortably	☐	☐	☐	☐
(e) ...cough or snore loudly	☐	☐	☐	☐
(f) ...feel too cold	☐	☐	☐	☐
(g) ...feel too hot	☐	☐	☐	☐
(h) ...had bad dreams	☐	☐	☐	☐
(i) ...have pain	☐	☐	☐	☐
(j) Other reason(s), please describe				

How often during the past month have you had trouble sleeping because of this?	☐	☐	☐	☐

	Very good	Fairly good	Fairly bad	very bad
6. During the past month, how would you rate your sleep quality overall?	☐	☐	☐	☐
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
7. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?	☐	☐	☐	☐
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	☐	☐	☐	☐
	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	☐	☐	☐	☐
	No bed partner or roommate	Partner/roommate in other room	Partner in same room, but not same bed	Partner in same bed
10. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	☐	☐	☐	☐

If you have a roommate or bed partner, ask him/her how often in the past month you have had...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
(a) ...loud snoring	☐	☐	☐	☐
(b) ...long pauses between breaths while asleep	☐	☐	☐	☐
(c) ...legs twitching or jerking while you sleep	☐	☐	☐	☐
(d) ...episodes of disorientation or confusion during sleep	☐	☐	☐	☐
(e) Other restlessness while you sleep; please describe	☐	☐	☐	☐

7.7.1 PSQI Permission

DePolo, Kristine Mar 31, 2022, 11:02 PM (12 hours ago) ☆
Greetings, Sally Al-Assar, I have forwarded your PSQI (Pittsburgh Sleep Quality Index) re...

Gasiorowski, Mary <GasiorowskiMJ@upmc...> 2:46 AM (9 hours ago) ☆ ↩ ⋮
to me ▾
Sent on behalf of Carolyn Weber

Research use of the PSQI:

Dear Sally Al-assar,

Thank you for your interest in our PSQI instrument. I can give you permission to use the PSQI **only** in non-commercially funded research or education or the product or service you are testing is not a commercial product or is in development by a commercial entity. It cannot be used for patient care either. If your use does **not** fall under those conditions, you can use the survey according to the following provisions:

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Our university has instituted a new policy for foreign licensing entities. There are additional clauses that are added to these agreements. Due to this added language, the agreement now needs routed through several departments at the university for review and approval first before final execution of the agreement.

7.8 Appendix 8. International Physical Activity Questionnaire

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (August 2002)

SHORT LAST 7 DAYS SELF-ADMINISTERED FORMAT

FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is supported to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is on-going and an *International Physical Activity Prevalence Study* is in progress. For further information see the IPAQ website.

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective*. Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

SHORT LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised August 2002.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

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

_____ **days per week**

☐

No vigorous physical activities → **Skip to question 3**

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

_____ **hours per day**

_____ **minutes per day**

☐

Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

☐

No moderate physical activities → **Skip to question 5**

SHORT LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised August 2002.

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

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

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

_____ **days per week**

☐ No walking → **Skip to question 7**

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

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.

7.8.1 IPAQ Permission



Menu

Home

Background

IPAQ scoring protocol

Cultural adaptation

References

Downloadable questionnaires

Home

Dear colleague,

Welcome to the website for the **International Physical Activity Questionnaire**. Here you will find information about the use of the questionnaire and links to the [questionnaire](#) itself, in multiple languages.

This physical activity questionnaire is publicly available, it is open access, and no permissions are required to use it. So we encourage any researchers to use it where it will be an appropriate measure of physical activity, particularly in large population studies or in the context of physical activity surveillance for which this measure was designed.

Regarding Scoring of the IPAQ: Over the past 10–15 years, we have had many requests that have asked for support with the IPAQ algorithm or [scoring protocol](#), and other methodological issues. For many years, a group of four or five of us that initially developed and tested the IPAQ measure have responded to all these enquiries, but the volume of them has continued to increase in recent years. Most of the requests come from students or graduates doing pieces of research using the IPAQ, and where students are able to ask a local senior researcher for help, particularly one with physical activity experience or a local biostatistician, they usually find that the scoring problems can be resolved.

After many hundreds of such enquiries we have decided that we have served the IPAQ measure and its development well, but that we no longer can provide the individual support to answer all these queries,

7.9. Curriculum Vitae

Personal Informations

Name	SALLY	Surname	AL-ASSAR
Place of Birth		Date of Birth	
Nationality		TR ID Number	
E-mail		Phone number	

Education

Degree	Department	The name of the Institution Graduated From	Graduation year
Doctorate			
Master	Physiotherapy & rehabilitation	YEDTIPE UNIVERSITY	TBA
University	Physiotherapy & rehabilitation	UNIVERSITY OF SHARJAH	2019
High school	-	ALMAARIFA INTERNATIONAL SCHOOL	2015

All the grades must be listed if there is more than one (KPDS, ÜDS, TOEFL; EELTS vs),

Languages	Grades (#)
TOEFL	103
IELTS	7.5

Work Experience (Sort from present to past)

Position	Institute	Duration (Year - Year)
Exercise Rehabilitation Specialist	Waves EMS Studio	-
		-

Computer Skills

Program	Level
Microsoft Word	good
SPSS	basic

*Excellent , good, average or basic

Scientific works

The articles published in the journals indexed by SCI, SSCI, AHCI

Articles published in other journals

Proceedings presented in international scientific meetings and published in proceedings book.

Journals in the proceedings book of the refereed conference / symposium

Others (Projects / Certificates / Rewards)
