T.C.

YEDITEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION

EFFECTS OF SEDENTARY LIFESYTLE ON NECK PAIN AND SLEEP QUALITY DURING COVID-19 PANDEMIC

MASTER THESIS

DUYGU KÖSEDAĞI, PT

ISTANBUL, 2022

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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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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.

Duygu Kösedağı

DEDICATION

I would like to dedicate my dissertation work to my family always supporting me. A special feeling of gratitude to my well beloved parents Nilüfer Kösedağı and Paşa Kösedağı, and my lovely sister Burcu Kösedağı.

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LIST OF SYMBOLS AND ABBREVIATIONS

BMI: Body Mass Index

CM: Centimeter

CNS: Central Nervous System

COVID-19: Coranavirus Disease 2019

EEG: Electroencephalograph

GABA: Gaba Amino Butyric Acid

IPAQ: International Physical Activity Questionnarie

IPAQ-SF: International Physical Activity Questionnarie – Short Form

KG: Kilogram

MAX: Maximum

MET: Metabolic Equivalent of Task

MIN: Minimum

NBQ: Neck Bournemouth Questionnarie

NREM: Non-rapid Eye Movement

N1: NREM Stage 1

N2: NREM Stage 2

N3: NREM Stage 3

N4: REM Sleep

PSQI: Pittsburgh Sleep Quality Index

PSS: Perceived Stress Scale

R: Spearman Correlation Coefficient

RAS: Reticular Activating System

REM: Rapid Eye Movement

SBRN: Sedentary Behavior Research Network

SD: Standart Deviation

SPSS: Statistical Package for Social Science

SWS: Slow-wave Sleep

TPAS: Total Physical Activity Score

WHO: World Health Organization

X^2: Chi-Square Test

Z: Kruksall Wallis H

ABSTRACT

KOSEDAGI, D. (2022). Effects of Sedentary Lifestyle on Neck Pain and Sleep Quality During COVID-19 Pandemic. Yeditepe University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, MSc Thesis, Istanbul.

The objective of the study is to understand the impact of sedentary life on sleep quality, neck pain and perceived stress. Five hundered twelve participants included in the study. The participants were aged from 18 to 28. The survey created with google forms was sent to the participants and the data was gathered. The International Physical Activity Questionnaire-Short Form (IPAQ-SF) was used to identify the activity level in metabolic equivalent of task (MET), the Perceived Stress Scale (PSS) was used for the perceived stress levels, and the Pittsburgh Sleep Quality Index (PSQI) was used to evaluate the sleep quality. The Neck Bournemouth Questionnaire (NBQ) was used for the level of neck pain. The demographic data and screen time informations were collected with a questionnarie. Three different groups were formed from the participants based on their total physical activity scores (TPAS), as physically inactive (TPAS<600 MET), low physical activity level (TPAS 600-3000 MET), and adequate physical activity level (TPAS>3000). SPSS ver. 23.0 was used for statistical analysis. A statistically significant difference was found between the sitting time and PSS between the groups ($p<0.05$); there was no statistical significant relationship between screen time, NBQ and PSQI score between the groups ($p>0.05$). A negative correlation was found between TPAS of all participants in the study and NBQ, PSS score and sitting time. As a result of in-group analysis, a statistically significant relationship was found between NBQ and PSQI score ($p<0.05$), NBQ and PSS score ($p<0.05$), and PSS and PSQI score ($p<0.05$).

Key words: physical activity, sleep quality, perceived stress, neck pain, screen time

ÖZET

KOSEDAGI, D. (2022). COVID-19 Sürecinde Sedanter Yaşamın Boyun Ağrısı ve Uyku Kalitesine Etkisi. Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Yüksek Lisans Tezi. İstanbul.

Bu çalışmanın amacı sedeanter yaşamın uyku kalitesi, boyun ağrısı ve algılanan stres üzerine etkisini araştırmak. Çalışmaya 18-28 yaş aralığında 512 katılımcı dahil edilmiştir. Çalışma google forms aracılığı ile yürütülmüştür. Katılımcıların aktivite düzeylerini metabolik eşdeğer dakika (MET) cinsinden belirlemek amacıyla Uluslar Arası Fiziksel Aktivite Anketi-Kısa Form (UFAA-KF), algılanan stres seviyelerini ölçmek için Algılanan Stres Ölçeği (ASÖ), uyku kalitesini hakkında bilgi edinmek için Pittsburgh Uyku Kalitesi İndeksi (PUKİ), boyun ağrısı için ise Bournemouth Boyun Ağrısı Anketi (BBAA) kullanılmıştır. Katılımcıların demografik verileri ve ekran sürelerini de oluşturulan bir form ile sorgulanmıştır. Katılımcıları total fiziksel aktivite skorlarına (TPAS) göre fiziksel olarak inaktif (TPAS<600 MET), düşük fiziksel aktivite seviyesi (TPAS 600-3000 MET) ve yeterli fiziksel aktivite seviyesi (TPAS>3000) olarak üç gruba ayrılmıştır. SPSS ver. 23.0 kullanılarak istatistiksel analiz yapılmıştır. Gruplar arasında oturma süresi ve algılanan stress seviyeleri arasında anlamlı ilişki bulunmuş ($p<0.05$) ancak; gruplar arası ekran süresi, boyun ağrısı ve uyku kalitesi arasında anlamlı ilişki bulunamamıştır ($p>0.05$). Oturma süresinde ve algılanan stres seviyelerinde meydana gelen istatistiksel olarak anlamlı farkın inaktif gruptaki verilerden dolayı meydana geldiği bulunmuştur ($p<0.05$). Çalışmadaki tüm katılımcıların total fiziksel aktivite skoru ile boyun ağrısı, algılanan stres düzeyi ve oturma süresi arasında negatif düzeyde ilişki saptanmıştır. Grup içi analizler sonucunda boyun ağrısı ile uyku kalitesi ($p<0.05$), boyun ağrısı ile stres seviyesi ($p<0.05$) ve algılanan stres seviyesi ile uyku kalitesi arasında ($p<0.05$) istatistiksel olarak anlamlı ilişki bulunmuştur.

Anahtar kelimeler: fiziksel aktivite, uyku kalitesi, algılanan stress, boyun ağrısı

1. INTRODUCTION AND PURPOSE

The most popular and common description of physical activity is ' These are movements resulting in energy expenditure which result from the contraction of skeletal muscles '. The most crucial element to be healthy is physical activity (1). Regular physical activity decreases pain levels and the obesity risk and chronic disease. Additionally, it increases physical capacity, endurance and strengthens the immune system. Concurrently, physical activity promotes sleep quality and prevents the development of negative mental states like stress. On the contrary, a sedentary lifestyle not only increases the risk of many chronic conditions but also causes musculoskeletal pain, reduces sleep quality, and negatively affects mood states (2, 3).

Definitions of the terms ' physical inactivity ', ' inactivity ', and ' sedentary life' are still unclear. Hamilton et al. stated that sedentary behavior includes activities with low metabolic energy consumption. They highlighted 'sitting too much' as a common and important sedentary behavior that poses different health hazards associated with lack of exercise. (4). The Sedentary Behavior Research Network (SBRN) said that to clear up the confusion caused by many definitions of physical inactivity in the terminology, the term 'physical inactivity' means not following certain physical activity guidelines, doing an insufficient amount of physical activity (5).

Sleep is a fundamental part of health. It corresponds to approximately one-third of the human life span. In a state of sleep, people partially lose contact with their environment for a while. Sleep is a part of an individual's daily life. While asleep, the body re-activates itself. Therefore, sleep is very vital for physical and mental health (6). It has positive effects on the immune system. Sleep is also a keystone of mental health (7). Sleep quality refers to how well an individual sleeps during the nighttime. It can be said; that a person has good sleep quality if a person feels fit, ready to start the day, and well-rested (6).

The Canadian 24-Hour Movement Directive, published in 2020, recommends that

adults aged 18-64 get at least 150 minutes of moderate to vigorous physical activity per week, several hours of mild physical activity (including standing), 7 to 9 hours of sleep per day, and no more than 8 hours of screen time per day (8). Within this total time of 8 hours, it is recommended that the amount of time spent at the front of a screen for entertaining be less than 3 hours. It is recommended that the person take breaks as often as possible during the long sitting periods (8).

Neck pain definition is as pain in the back of the cervical spine. It is the most prevalent cause of pain (9). Neck pain is a widespread and serious issue all over the world. It is closely related to personal and environmental circumstances. Although the relationship of psychosocial factors with neck pain has been proven, the data on the influence of physical activity on pain state is still unclear (10). Poor sleep quality is a large complaint among persons suffering from neck problems about pain. In addition, it is known that poor sleep quality occurs before the onset of depressive mood (11).

In late December 2019, an undiagnosed case of respiratory tract infection occurred in Wuhan, a city in China's Hubei province. In February 2020, The World Health Organization made the announcement (WHO), that the virus that causes this disease is a newly developing coronavirus. WHO described its name as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, COVID-19) (12). In the ongoing period of the disease, it spreads rapidly throughout the world, including in Turkey. In this way, the COVID-19 pandemic has become a global threat. It has been reported to the whole world by WHO that social distance should be provided to reduce the spread rate of this disease and to prevent patient density. Schools, public places, and some businesses have been closed around the world in order to reduce human mobility and ensure social distance. People are warned not to leave their homes unnecessarily. Schools have decided to continue education online way. People are warned to leave the house only to meet their basic needs and go to work (13). Restrictions are effective to prevent the COVID-19 epidemic but they have restricted many movements in daily life. People staying in their homes have had to adopt a sedentary lifestyle (13). This leads to a significant decrease in maximum oxygen consumption, physical endurance and capacity, and muscular strength loss (12). With online education and working from home, screen

time has also increased. Although social media and digital device use are factors that increase social isolation, they can cause sleep problems in young adults when used before going to bed. Social isolation also causes negative emotional states such as loneliness, anxiety, and depression (10).

Current evidence on sleep disturbances and neck pain associated with the COVID-19 pandemic is unclear. Few studies have also suggested that sleep disorders increase with the change in daily living habits (14). According to Becket al., the quarantine during the Covid-19 epidemic exacerbated sleep problems (15). Marelli found in his study that restrictions have negative consequences on sleep quality (16). Recent studies report that neck pain problem to experience lead to mild to severe sleep problems after the pain develops (17,18). Some studies say that there is a strong relationship between depression and sleep disorders. (19).

Many studies compare physical activity level and mood state, or physical activity and sleep quality. The relationship of physical activity with musculoskeletal pain has been examined in several studies, but no specific study has been conducted on neck pain. Studies investigating the effects of the global epidemic are limited. The effects of restrictions that have to be applied due to the epidemic, screen time, and reduced mobility on neck pain, sleep quality, and perceived stress are still unknown. Our investigation's goal is to understand the effect of physical activity level and screen time on neck pain, perceived stress, and sleep quality and to emphasize the importance of physical activity despite mandatory restrictions.

Two hypotheses were determined in this study:

H0: Sedentary lifestyle has no effect on neck pain, sleep quality, and mood states.

H1: Sedentary lifestyle has an impact on neck pain, sleep quality, and mood states.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. Physical Activity

The words physical activity, sport, and exercise are often used correspondently but this use is not correct. Sports; are physical activities that aim to surpass himself or herself or the other person. They have a sense of competition, have rules, and are done individually or with a team (20). Exercise, inversely, is regular physical activities performed to improve various aspects of the physical fitness level (21).

Physical activity is defined as bodily motions caused by muscle contractions that result in energy expenditure (22). Another explanation is a set of activities that lead to energy expenditure in addition to the amount of energy expended at rest (23). Physical activity is defined by the World Health Organization (WHO) as any movement produced by muscles that result in energy expenditure. Physical activity encompasses all movements, even if leisure time activity, transportation, or any work (24).

Physical activity is mostly explained in four dimensions. These are activity type, activity duration, activity frequency, and activity intensity. Occupational activities, housework, transportation, and leisure activities are some of the types of physical activity. Frequency; is the average number of training sessions in a given period; duration refers to the average number of minutes in a period of the activity. For example, when we say 45 minutes of physical activity 6 days a week, it means that the frequency of the activity is 6 days and the duration of the activity is 45 minutes. Intensity is related to the rate of energy expenditure during the activity. Numerous methods can be used to indicate the amount of energy expended during physical activity. Among these, the most widely used method is the metabolic equivalent (MET) method, which expresses energy expenditure as multiples of resting energy expenditure (25).

Physical activity is an important parameters for maintaining health. Regular physical activity helps prevent and manage various diseases. Cardiovascular disease, diabetes, and several forms of cancer and obesity are among them. It also helps improve

sleep quality, well-being, and quality of life (24).

WHO guidelines provide details about physical activity guidance for people on how much physical activity they need to stay healthy (24). Especially for adults between 18–64 years;

1. Capable of doing 150-300 minutes of moderate-intensity physical exercise. As a second option, a minimum of 75-150 minutes of vigorous-intensity physical activity can be done. A mix of moderate to vigorous-intensity activities can be done over the week as a third alternative.

2. At least two days a week, moderate or high-intensity activities to strengthen large muscle groups should be performed.

3. The first option is, that at least 300 minutes of moderate-intensity physical activity can be done. Second, a minimum of 150 minutes of vigorous-intensity physical activity can be done. Additionally, a mix of moderate to vigorous physical activity can be done throughout the week.

4. Time spent sedentary should be limited. Replacing sedentary lifestyle behavior with physical activity of any amount.

For being healthy, all adults and older adults should aim to do even more than determined physical activity. (24).

2.1.1. Physical Activity Assessment Methods

There are several approaches for assessing physical activity (26). Some of these methods are energy expenditure, direct observation, diaries, questionnaires, and interviews, recording of physiological responses to activity, portable recording devices such as pedometer and accelerometer, and methods like the doubly-labelled water method (27).

The most predominantly used methods to measure physical activity and energy consumption are physical activity questionnaires and movement measurement devices (28). Gold standard methods such as direct calorimetry, the doubly-labelled water method are not used in energy expenditure measurements, although they give accurate results because they evaluate physical activity subjectively and precisely (29, 30). However, these methods are very expensive and this situation leads to restrictions on their use. Questionnaires are inexpensive, easy to use, provide accurate results, and are the most appropriate method in studies with large populations (30).

One of the accepted questionnaires is the International Physical Activity Questionnaire (IPAQ). It is used for individuals between 18-65 ages. It is used in approximately 70 countries (31). Other examples of physical activity questionnaires are the European Health Interview Physical Activity Questionnaire (EHIS-PAQ), Bouchard Physical Activity Diary, Frenchay Activity Index, and Human Activity Profile-HAP.

2.2. Sedentary Behavior

The Sedentary Behavior Research Network (SBRN), which is aware of many physical inactivity definitions in terminology, 2012, said that the term 'physical inactivity' means doing an insufficient amount of physical activity (spending less than 1.5 Metabolic Equivalent of Task (MET)) (5). Sleeping, sitting, watching television, lying and using a computer are examples of sedentary activities.

2.2.1. Associated Problems of Sedentary Behavior

Sedentary behaviors have wide-ranging adverse effects on the human body. Such as increased all-cause mortality, some diseases, cancer risk, and risks of metabolic disorders, musculoskeletal disorders, and cognitive impairment (32).

According to WHO data, one of the biggest causes of mortality is a lack of physical exercise. According to WHO, the quantity of physical activity in the adult population is about 17%, and inadequate physical activity is responsible for 1.9 million

deaths each year (33). Physical inactivity is responsible for 15% of all-cause mortality in our country (34). Adults should minimize their time spent inactive, according to the World Health Organization. Replacing a sedentary lifestyle with physical activity is essential for maintaining health (35).

2.3. Sleep

Sleep is one of the most important requirements that affect the vital and behavioral functions of the individual. It corresponds to about one-third of the human lifespan. Sleep is a part of an individual's daily life. While sleeping, the body reactivates itself. It is a process that mammals need in terms of preserving the energy in the body and renewing the nervous system structures. In this process, the level of physical activity is reduced to a minimum (33). Sleep duration differs from person to person. In general, this period varies between 4 hours and 11 hours. This variation in sleep time is age, gender, physical condition, work, exercise, nutrition, health status, environmental conditions, and individual characteristics dependent (36).

Sleep is a vital physiological phenomenon (37). Sleep is very crucial for physical health and also has positive effects on the immune system (38). Additionally, It also plays a key role in mental health (39). Sleep disorders are becoming a major public health concern (40). Among these sleep disorders, the primary reason for sleep disorders are insufficient sleep and sleep quality as the most popular ones (40).

2.3.1. Types of Sleep

Normal sleep has two characteristic phases. These phases come one after another during sleep. These are non-rapid eye movement (NREM) and rapid eye movement (REM) sleep (41). The electroencephalograph (EEG) is used to record electrical currents from the brain, the electrooculogram (EOG) is used to record eye movements, and the electromyography (EMG) is used to record muscle tonus for evaluate sleep phases (41,42). Table 2.1. summarizes the four stages of sleep (41).

Table 2.1. The Four Stages of Sleep Cycle (41)

NREM Stage 1 (N1)	• The shift from awake to sleep • It lasts approximately 5 to 10 minutes.
NREM Stage 2 (N2)	• The body's temperature decrease • Heart rate starts to slow down • The brain starts producing sleep spindles. • It lasts around 20 minutes.
NREM Stage 3 (N3)	• Muscles relax • Blood pressure and respiratory rate are both lowering. • The deepest sleeping happens
REM Sleep (N4)	• Brain activity increases • The body relaxes and becomes immobile. • Dreams happen • The eyes react rapidly.

NREM sleep, similar to NONREM sleep or slow-wave sleep (SWS), begins with the shift from awake to asleep. Then it progresses toward deep sleep (43). Although NREM sleep is often called dreamless sleep, dreams can occur during NREM sleep. NREM sleep lasts about 90-100 minutes. It accounts for about 75-80% of the sleep time during the night. It consists of four stages (40, 43). N1, N2, and N3 are the three stages of NREM that are distinguished by different brain activities (40).

REM sleep, known as desynchronized or paradoxical sleep, is not divided into separate phases but contains tonic and phasic elements. Tonic elements are characterized by atony in skeletal muscles other than eye muscles and diaphragm. Phasic elements appear as irregular rapid eye movements and muscle twitches (41, 42). During REM sleep, high-frequency, low-amplitude beta wave-like asynchronous brain waves can be seen in EEG readings (43).

The transition from the NREM period to the REM period occurs 90 minutes after sleep begins. During the night, a REM period occurs every 90-100 minutes. REM sleep corresponds to 20-25% of total sleep duration, generally lasting approximately 5-30 minutes in a normal night's sleep. When the person is very tired, the REM period is shortened, When a person feels rested during sleep, his REM period is prolonged (42, 44). Although dreams occur in all sleep periods, 80% of dreams occur in this phase. During this period, brain activity is high; as the brain consumes more oxygen and

glucose, brain metabolism increases by about 20% (40, 43). Waking up during REM sleep is more difficult than during SWS. In this stage, pulse and breathing increase and become irregular. (41, 42).

Transitions between NREM and REM sleep are mediated by reciprocal inhibition in the brainstem between monoaminergic neurons and a subset of cholinergic neurons (45). These "REM-on" cholinergic neurons have inhibitory reciprocal connections with noradrenergic and serotonergic (raphe) neurons (46). When REM sleep is initiated, REM-on cholinergic neurons become active, whereas noradrenergic and serotonergic neurons become almost inactive. The switch between activation and inactivation of these neurons causes alternating between NREM and REM sleep (46).

2.3.2. Sleep-Wake Regulation and Circadian Rhythm

In the sleep-wake regulation, many centers and neurotransmitters from the medulla to the brainstem, hypothalamus, and the basal forebrain are involved. Neurons that activate sleep-wake regulation are found in various concentrations in the pontis oralis, mesencephalic central tegmentum, posterior hypothalamus and midline brain stem, dorsolateral medullary reticular formation, and anterior hypothalamic-preoptic regions.

Sleep-related neurotransmitters include dopamine, acetylcholine, serotonin, noradrenaline, histamine, Gaba Amino Butyric Acid (GABA), and adenosine. Dopamine is a substance with both inhibitory and excitatory aspects. However, it is generally inhibitory. It is released from the basal ganglia from dopaminergic neurons in the substantia nigra. Acetylcholine is released from the excitatory neurons (giant cell nucleus of the reticular formation) in the reticular structure of the pons and mesencephalon. It is an excitatory neurotransmitter. It is thought that serotonin initiates genomic events in hypnogenic neurons in the preoptic area so that the release of serotonin in wakefulness homeostatically regulates slow-wave sleep (47). Noradrenaline is released from the locus coeruleus located between the pons and the mesencephalon. It is an excitatory neurotransmitter. Gabaergic neurons are placed in the ventrolateral preoptic nucleus of

the basal forebrain. Gabaergic neurons, which play an active role during sleep, play an important role in sleep initiation and maintenance by suppressing histaminergic and other wakefulness-producing cell types (48). GABA levels increase in the posterior hypothalamus during slow-wave sleep, and in the dorsal raphe and locus coeruleus during REM sleep. Gabaergic neurons are hypothesized to have a function in REM sleep onset and maintenance (49, 50). Adenosine, which plays a role in SWS, increases in the brain as wakefulness continues and decreases following sleep (49).

Neurotransmitters related to wakefulness are Acetylcholine, Noradrenaline, and Histamine. There is a positive correlation between acetylcholine secretion from the basal forebrain and the presence of gamma and beta frequency bands on the EEG, and a negative correlation between delta activities (48). In some studies, acetylcholine injection caused a REM sleep-like state with muscle atony (51). In the brainstem, groups of neurons that secrete norepinephrine are mainly found in the locus coeruleus and lateral tegmental region. Noradrenaline is secreted during wakefulness. While noradrenaline secreted from the lateral tegmental region controls the hypothalamus and motor behavior, the locus coeruleus regulates sensory input and cortical activation (52). One of the main sites of histaminergic neurons in the brain is the tuberomammillary nucleus in the hypothalamus. This nucleus is one of the basic structures in the organization of wakefulness with its excitatory effect. The decrease in histamine release in sleep centers leads to loss of consciousness during sleep, and by this mechanism, antihistamine drugs lead to sleep. Direct administration of histamine to the cerebral ventricles increases the level of alertness by causing cortical activation (52, 53).

There are neural areas about the sleep-wake rhythm in the brain stem. Various neural structures (nuclei) in the mesencephalon, pons, and bulb form a functional area called the Reticular Formation. Reticular structures related to consciousness and sleep constitute a crucial component of this system. Some of these structures are responsible for excitation, while others are responsible for inhibition.

The reticular formation consists of the reticular activating system (RAS), the reticular inhibitory area, and the locus coeruleus. The RAS is associated with the activity

of neurons in the reticular formation area in the brainstem, and this neuron group is called the "ascending reticular activator system". This system projects to the thalamus and to the cells that produce cortical activation in wakefulness. These neurons also project to the hypothalamus and basal forebrain. RAS is a polysynaptic pathway. It is an area formed by clusters of excitatory neurons in the reticular structure of the Reticular Formation. These are of two different types. Giant cell nuclei secrete acetylcholine. It has stimulating and excitatory effects on brain activity. Small cell nuclei increase alertness by stimulating the cerebral cortex.

The RAS is an area responsible for alertness. All sensory impulses reaching the cerebral cortex by peripheral nerves are evaluated in the cortex. After the evaluation, impulses go from the cortex to the RAS. RAS is stimulated. Following this, excitatory impulses arise from the RAS to the cortex. Therefore, with this positive feedback, it is ensured that the alertness level of the brain is maximized. These cholinergic neurons connect to the thalamus and control whether the brain stem gate is open or closed. During sleep, contact with the environment is cut off, we do not hear, feel, taste, smell, and see, even with our eyes open. During sleep, people have different thresholds for stimuli; but if stimuli are strong enough, can wake anyone up. Thanks to the thalamus, the brain cuts off the sensory input and our sleep is not interrupted. Acetylcholine sensitizes neurons in the thalamus. It slightly depolarizes the thalamic neurons, making the thalamus more sensitive to sensory input, thus enabling the transition from sleep to wakefulness.

The reticular inhibitory area consists of medial and ventral serotonergic neurons of the medulla oblongata. The nuclei consisting of medial and ventral serotonergic neurons of the medulla oblongata are called "Raphe Nuclei". Serotonin is an inhibitory neurotransmitter in the central nervous system (CNS). Serotonin released from this area plays a role in initiating sleep with its inhibitory effect on cholinergic neurons.

The locus coeruleus is a structure in the brain stem that is placed between the dorsal pons and the mesencephalon. All the fibers that spread to the brain come out from here. These neurons release noradrenaline. Noradrenaline produces high-level activating effects on the cortex. With the effect of these neurons, the concentration of noradrenaline

increases, and a high level of alertness is reached. The projections of the locus ceruleus extend to the neocortex, hippocampus, thalamus, cerebellar cortex, pons, and medulla. During sleep, the firing rate in the locus ceruleus decreases, and this firing rate increases during REM sleep. The locus ceruleus also have a critical role in the starting of REM sleep. In locus ceruleus lesions, REM disappears and awakening increases (54).

2.3.3. Sleep Quality

Sleep quality refers to how well an individual sleeps during the nighttime. A person has good sleep quality if a person feels fit, ready to start the day, and well-rested (6). Sleep quality can be affected by various factors. Some of these are lifestyle, work, environmental factors, stress, habits (55).

Habits and behaviors have decisive effects on our sleep quality. While some habits create positive effects on sleep quality, some habits affect our sleep quality negatively. Habits and behaviors that negatively affect sleep quality; taking a nap during the day, having an irregular sleep schedule, being exposed to light (fake light or screen light) in the evening, using wakefulness-enhancing substances (such as caffeine, cigarettes) close to bedtime, engaging in stimulating or stressful activities close to bedtime (arguing with a partner, working at work), sleeping with a tablet or smartphone in bed, routinely using the bedroom for sleep, and non-sex activities (watching TV, working) (56, 57).

Many medical conditions affect sleep quality negatively. Painful conditions, cardio-respiratory diseases, obesity, psychiatric disorders, neurological and hormonal disorders can be given as examples of medical conditions that affect sleep quality negatively. Pain or pain due to illness interrupts sleep. Some patients cannot have a good sleep due to respiratory distress. Sleep problems are seen in approximately 80% of patients with a psychiatric disorder, and approximately half of all chronic insomnia cases are associated with a psychiatric disorder (56). It is observed that a diet rich in carbohydrates increases sleepiness, and high-protein foods increase alertness. It would be better not to go to bed on an empty stomach, but to avoid excessive and heavy meals

and excessive fluid intake (as it may result in frequent urination at night) in terms of quality sleep (58). There are many studies showing how physical activity affects sleep quality. This effect may vary based on the duration and intensity of physical activity, as well as the person's physical condition, and its impact on sleep may be beneficial or negative (58, 59).

2.3.4. Sleep Quality Assessment Methods

Many scales have been developed to evaluate sleep quality. It is possible to examine the scales in three groups. The first group of sleep scales is generally used in epidemiological studies to determine sleep patterns, sleep problems, and sleep quality. In these scales, the questions focused more on the sleep duration, the occurence of insomnia, and using sleeping pills. In clinical investigations, the measures in the second group are used to compare subjective reports, variations between individual groups, and polysomnographic reports. These scales are mostly based on quantitative measurements. The third group of scales is generally used to compare the differences between quantitative and qualitative items about the initial night's sleep, to differentiate between excellent and poor sleep characteristics, and to investigate the impact of drug usage affect sleep (60). Examples of the developed scales are Pittsburgh Sleep Quality Index (PSQI), Richard-Campbell Sleep Scale, Berlin Sleep Questionnaire, Epworth Sleepiness Scale, Sleep Time Delay Scale, Sleep Hygiene Index, Insomnia Severity Index, and Stanford Sleepiness Scale.

2.4. Cervical Region Biomechanics

The cervical spine is located between the head and neck. It protects vital neurological structures and has a wide range of motion. Therefore, it is among the most complex structures of the body.

Each vertebra is supported by muscles and ligaments. These structures, at the same time, brought plasticity to the spine as they are connected with an upper and lower segment at each level. The mobility of the cervical vertebrae is related to the anatomical

and mechanical properties of the bones and ligaments (61).

The basic movements of the cervical region can be counted as flexion, extension, lateral flexion, and rotation. The cervical area is separated into two upper cervical regions and a lower cervical region in terms of mobility and features. The upper cervical region (C1: atlas, C2: axis) is designed for mobility. Most of the cervical flexion, extension, and axial rotation takes place in this region. In addition, a great variety of motion is provided in this region thanks to the synovial joints. The vertebrae of the lower cervical region (C3, C4, C5, C6) are in lordotic alignment. It is more stable than the upper region. They contribute to the general movement (62).

There are approximately 120-130 flexion and extension movements in the cervical region. In the resting position, it is approximately 30-35 in extension (61). Starting from the resting position, it can perform 75-80 extension and 45-50 flexion movements. Hyperextension and hyper-flexion movements are limited by peripheral structures. The cervical vertebral canal is widest in full flexion and narrowest in full extension (61). Therefore, individuals with vertebral stenosis are more likely to experience spinal nerve injuries during hyperextension activities. In the sagittal plane, the cervical region moves forward (protraction) and backward (retraction). Protraction movement has an 80% wider range of motion than retraction movement. In the forward movement of the head, flexion in the lower and middle cervical region and extension movement in the upper cervical region occur (61). In the opposite direction, the head moves backward (61). A long time spent in protraction causes the head to be chronically anterior and causes tension in the extensor muscles. The cervical region makes an axial rotation of approximately 65-75 degrees in both directions. Half of the axial rotation occurs at the atlantoaxial joint, while the other half occurs at the C2-C7 segments (61). In the frontal plane, approximately 35-40 degrees of lateral flexion occurs on both sides of the cervical region and is usually accompanied by rotation. The combination of lateral flexion with rotation is called compound movement. Most of the movement occurs in the C2-C7 segments (61).

2.4.1. Neck Pain

Neck pain is usually described as pain or stiffness in the dorsal region among the occipital region and the seventh cervical vertebra. Neck pain is a significant health issue that affects 45 to 54 percent of the population (63).

Most people have neck problems at some point in life. At the same time, it causes economic burdens due to neck pain, labor losses, and health expenditures. Recently, the incidence of neck pain has been increasing due to reasons such as working conditions at home and a sedentary lifestyle (63).

2.4.2. Neck Pain Etiology and Risk Factors

The etiologies of neck pain are often multifactorial and difficult to determine. It may occur as a component of musculoskeletal, neurological diseases, or a wide variety of metabolic, infective, and tumoral disorders (64).

Several factors are considered to predispose to neck pain. These factors might be of psychological, physiological, or occupational cause. Stress, gender, poor health condition, obesity, depression, history of neck injury are considered to be important risk factors for neck pain (63). While Bogduk and McGuirk state that education level, occupation, injury history, work environment, type of device used, and stress are the most important etiological factors, they also report smoking, socioeconomic status, and sitting for a long time as important factors (65).

2.4.3. Mechanical Neck Pain

It is described as pain that occurs in the cervical region, occipital or posterior scapular region without a specific pathology such as an underlying neurological problem or tumor (66, 67). The problem, whose mechanism and cause are not fully known, mainly occurs due to biomechanical disorders, and the symptoms generally increase with cervical movements, keeping the same position for a long time, and palpation of the

muscles (68). Neck pain starts acutely, but only 36% of the population has the pain problem resolved. It has been observed that 32% of the remaining individuals do not fully recover, even if a certain degree of improvement occurs in their condition, 37% of them continue without any change in their pain, and even in some individuals, the pain even increases (69).

People with mechanical neck pain, strength and endurance losses are observed in the deep cervical muscles (70). These muscles show delayed and low muscle activation during cervical movements. They are insufficient to provide postural control (71,72). In addition, deep cervical extensors have a smaller cross-sectional area in individuals having neck pain (73). Changes in muscle fiber types occur with neck pain; the number of Type-1 fibers in the deep group muscles decreases while the number of Type-2 fibers increases (74). In this case, the muscles with tonic properties lose their properties, and their resistance to fatigue decreases. They are insufficient to provide postural control (75). On the other hand, an increase in tone is observed in the superficial cervical group muscles and spasm occurs. Recent studies report those neck pain problems to experience lead to mild to severe sleep problems after the pain develops (76-79).

2.4.4. Pain and Sleep

Inadequate sleep quality may be associated with the presence of musculoskeletal pain. According to several research, fatigue, trouble falling asleep, waking up at night, and other issues are risk factors for musculoskeletal pain (80-82). The amount and quality of sleep may be a modifiable risk factor for musculoskeletal pain (83). In addition to muscular problems, sleep disruptions are regarded as a crucial factor in chronic pain. It is suggested that the trend of pain and sleep disruptions be addressed in the therapy of mechanical neck pain sufferers (84).

According to the neuromatrix hypothesis, pain is influenced by multiple elements such as psychological and general health issues. Fitting with the theory's emphasis on general health, sleep problems can affect the neuromatrix with adverse effects on other systems. Research suggests that sleep can affect neuromatrix by effects on systems. For

instance, sleeplessness makes individuals more susceptible to infection, decreases sympathetic system activity, increases the autonomic nervous system activity (85).

3. MATERIALS AND METHODS

The study was done online from January 2021 to May 2022. It was aimed to research the effect of sedentary life and screen time on neck pain, sleep quality, and perceived stress during the COVID-19 process. Six hundered people who were approved online were included. Study approval was given by the Yeditepe University Non-Interventional Clinical Research Ethics Committee. (Date: 02.09.2021; Application nu: 202105029) (Appendix 1.).

3.1. Participants

This research comprised participants ranging in age from 18 to 28 and the questionnaire was distributed to the participants via social media and social communication networks. Using GPower 3.1 Power Analysis, α=0.05, power (1-β) =0.95, effect size – f value was 0.22 (determined by the reference article), and the sample size of the study was found to be 306 people (89). During the process, 600 people were reached.

Data that will enable us to understand demographic information, screen time, neck pain, physical activity level, sleep quality, and perceived stress level were collected with a form created with Google Forms. (https://forms.gle/sAezzJJcVSm5smLn6). An informed consent form was used to informed all participants about the study. Prior to participation in the survey, informed consent was acquired. (Appendix 2.) Participants who did not consent to participating could not access the questionnaire. Access to the survey database was kept open throughout the data collection dates.

3.1.1. Inclusion Criteria

The criteria to be met by the people included in the study;

-To be between the ages of 18-28

-Not to have any problems that would prevent understanding the questions

-Any chronic pain that may cause neck pain and no diagnosed disorder

-No diagnosed psychiatric disorder

3.1.2. Exclusion Criteria

Participants were not included in the study if any one of the following conditions listed below. These conditions were determined as;

-Use of sleeping pills

-Use of psychiatric drugs

-Being diagnosed with a primary sleep disorder

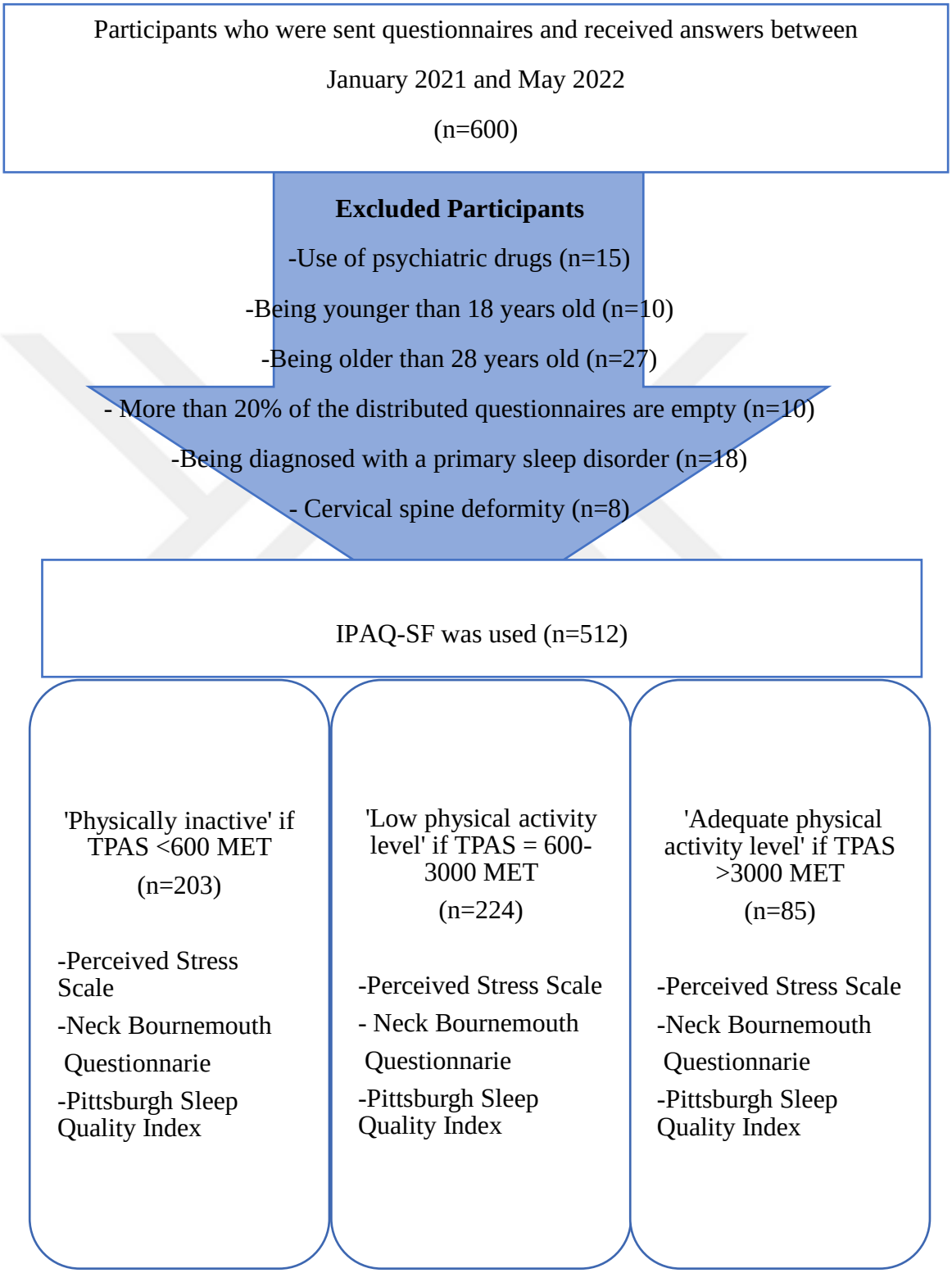
-Being younger than 18 years old and older than 28 years old.

- More than 20% of the distributed questionnaires are empty

- Cervical spine deformity

3.1.3. Flowchart: Study Protocol

Table 3.1. Flowchart of Study



3.2. Methods

For the participants; a questionnaire form including sociodemographic information, screen time, Pittsburgh Sleep Quality Index with questions about sleep, International Physical Activity Questionnaire (Short Form), Neck Bournemouth Questionnaire for measuring neck pain and its effect on daily life, and Perceived Stress Scale, which measures perceived stress.

3.2.1. Demographic Information Form

With the questions in the demographic information form gender, age, height (cm), weight (kg), coffee, tobacco, alcohol consumption, drug use, diagnosed systemic disease, current COVID-19 status, and daily screen time was questioned (Appendix 3.).

3.2.2. International Physical Activity Questionnarie-Short Form (IPAQ-SF)

IPAQ is designed in short and long forms to investigate physical activity level and sedentary lifestyle. The validity and reliability studies of the questionnaire were performed by Craig et al., and the Turkish validity and reliability studies were performed by Öztürk et al. (86, 87).

The short form of the questionnaire containing the "last seven days" was used in the study to assess physical activity level. In questionnarie duration of vigorous physical activity, duration of moderate physical activity, walking, and sitting times are questioned in the last 7 days (Appendix 4.).

The first two questions ask about vigorous physical activity in the last week, the next two questions about moderate physical activity in the last seven days, the next two questions about walking activity in seven days, and the last question about how much time was spent while sitting. Generally, in paired question groups, the first question asks how many days the activity is done and the second question asks how many minutes/hours the activity is done.

The overall score of the short form is calculated by adding the time (minutes) and frequency (days) of walking, moderate-intensity activity, and vigorous activity. The sitting score (level of sedentary behavior) is calculated apart. When evaluating the activities, it is required that each activity be completed for at minimum 10 minutes at a time (88).

The MET method is used when determining the physical activity level of the participants. MET stands for metabolic equivalent. 1 MET=3.5ml/kg/minute, that is, while the individual is resting/doing nothing, he/she consumes 3.5 milliliters of oxygen per kilogram per minute. When the minutes, days, and MET values are multiplied, a score in terms of "MET-minutes/week" is obtained. The total physical activity score (MET-min/week) is determined by calculating vigorous, moderate activity and walking times to MET (1 MET=3.5 ml/kg/min) corresponding to the basal metabolic rate (87).

In our study, we asked the participants the number of days they did vigorous and moderate-intensity exercise and the amount of time they spent exercising with the questionnaire we sent via google forms. At the same time, we inquired about the day and duration of the walk. We got information by asking questions about the time they spent sitting. With the data we obtained, we calculated the walking score, moderate-intensity, vigorous, and total physical activity score using the following methods separately for each participant. Based on the total physical activity score, we divided our participants into 3 groups.

The following calculations were performed with the data collected from the questionnaire to obtain the MET-minutes/week scores.

• Walking score (MET-min/wk) =

3.3 (x) Walking time (x) Walking days

• Moderate-intensity activity score (METdk/wk) =

4.0 (x) Moderate-intensity activity time (x) Moderate-intensity activity day

• Vigorous activity score (MET-min/wk) =
8.0 (x) Duration of vigorous activity (x) Days of vigorous activity

• Total Physical Activity Score (TPAS) =
Walking (+) Moderate activity (+) Vigorous activity score

As a result;
• 'Physically inactive' if TPAS <600 MET
• 'Low physical activity level' if TPAS = 600-3000 MET
• 'Adequate physical activity level' if TPAS >3000 MET (87).

3.2.3. The Neck Bournemouth Questionnaire (NBQ)

The Neck Bournemouth Questionnaire was adapted in 2002 from the Bournemouth Low Back Pain Questionnaire developed by Bolton and Humphreys (89). Low back and neck pain are complex problems that are affected by various risk factors. The purpose of creating the Bournemouth Low Back Pain Questionnaire was to require a multidimensional assessment of low back pain (90). The Neck Bournemouth Questionnaire, which was developed later, was adapted for individuals with neck pain due to the same need. In this adaptation, the number of questions in the questionnaire and the main areas to be evaluated have not changed. However, for the evaluation of low back pain, activities such as "walking," "climbing stairs," and "standing up from a chair" were replaced by "item lifting," "reading," and "driving.". The Turkish validity and reliability study of the questionnaire was conducted by Yılmaz et al. (91).

The Neck Bournemouth Questionnaire include 7 questions in total. The questions evaluate the last 7 days. The content of the questionnaire consists of variables such as pain severity, the effect of pain on activities of daily and social life, anxiety-depression level, kinesiophobia, and coping with pain (89) (Appendix 5.)

Each question scores between 0 and 10, and the participant is asked to choose a value for each question in the range of 0-10. The maximum score the participant will

receive is 70. A high score represents a greater amount of pain.

In our study, we added the 7-question The Neck Bournemouth Questionnaire to the questionnaire we sent via google forms and asked the users to mark the most appropriate level for each question on the Likert scale in figure 2. We calculated the total Bournemouth score for each participant with the data from the 7 questions. We assumed that an increased score indicates increased pain.

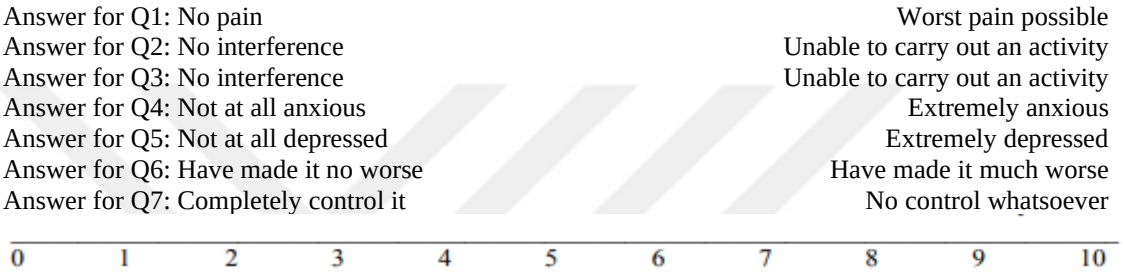


Figure 3.1. Neck Bournemouth Questionnarie Likert Scale Example

3.2.4. Pittsburgh Sleep Quality Index (PSQI)

Buysse et al. created the PSQI in 1989 to evaluate sleep quality (92). Ağargün et al. conducted the Turkish validity and reliability study of the scale (60). It is a scale which gives information about sleep quality and type, as well as the severity of sleep disturbances in the previous month. The survey has 24 questions. Nineteen of these questions are responded by participants, and the remaining 5 are answered by the bed/roommate. These 5 questions answered by the bed/roommate which are not included in the assessment, they are used for clinical information only (92).

18 items and 7 components are included in the scoring. These are; subjective sleep quality (component 1), latency (component 2), duration (component 3), habitual sleep efficiency (component 4), sleep-disturbing factors (component 5), using sleeping pills (component 6), and daytime dysfunction (component 7) (60, 92) (Appendix 6.)

Component one is obtained by scoring sixth question answers. This component

evaluates subjective sleep quality. It is aimed at learning how the participant evaluated the sleep quality of the last month as a whole. It asks the participant to choose one of the options (very good, fairly good, fairly bad, very bad). Each answer gets various points. Table 3.2 shows answers and their points.

Table 3.2. Answer Values of the Sixth Question

Answers	Component 1 Score
Very good	0
Fairly good	1
Fairly bad	2
Very bad	3

Component two is obtained by scoring questions 2 and 5a answers. It evaluates sleep latency. Question 2 inquired how long it took for the individual to fall asleep. Question 5a was asked to find out how often the participant had fallen asleep for more than 30 minutes in the past month. Table 3.3 shows the value of the answers to questions 2 and 5a. Table 3.4 explains how to obtain component two using the sum of Q2 and Q5a answers.

Table 3.3. Answer Values of the Question 2 and 5a

Q:2		Q:5a	
Answer	**Score**	**Answer**	**Score**
≤15min	0	**Not during the past month**	0
16-30 min	1	**Less than once a week**	1
31-60 min	2	**Once or twice a week**	2
>60min	3	**Three or more times a week**	3

Table 3.4. Component Two Equivalents of the Sum of Q2 and Q5a Answers

Q2+Q5a	Component 2 Score
0	0
1-2	1
3-4	2
5-6	3

Component three is obtained by scoring the fourth question answers. It evaluates sleep duration. Question four was asked to find out hours the participants slept at night during the past month. Table 3.5 shows the values of time intervals.

Table 3.5. Values of Time Intervals

Answer	Component 3 Score
>7 hours	0
6-7 hours	1
5-6 hours	2
<5 hours	3

Component four evaluates habitual sleep activity. It is calculated with the help of data obtained from questions 1,3 and 4. Question one was asked to find out when the participants went to bed at night last month. Question three was asked to find out when the participants got up in the mornings last month. Question four was asked to find out how many hours the participants slept last month. The habitual sleep efficiency is calculated in four steps with the help of these questions. Table 3.6 shows the values corresponding to the percentages.

1. Getting up time (Q3) – Bedtime (Q1) = Number of hours spent in bed

2. [Number of hours slept (Q4) / Number of hours spent in bed (Q3-Q1)] X 100 = Habitual sleep efficiency (%).

Table 3.6. Scores Corresponding to the Percentages

Habitual Sleep Eficency %	Component 4 Score
>85 %	0
75-84 %	1
65-74 %	2
<65 %	3

Component five provides information about sleep disorders. It is obtained by scoring answers in the 5b-5j interval. The corresponding values for the answers to each question are in Table 3.7. The values corresponding to the total scores of the answers of 5b-5j give the component five. Table 3.8. shows component five values.

Table 3.7. Scores Corresponding to the Answers to Each 5b-5j Question

Answers	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Table 3.8. Component Score Values Corresponding to the Sum of the Question 5b-5j Answers

Sum of 5b-5j	Component 5 Score
0	0
1-9	1
10-18	2
19-27	3

Component six is obtained by scoring the answers to the seventh question. It gives information about the use of sleeping pills. Question seven was asked to find out how

often the participant used prescription or nonprescription sleeping pills to help him sleep in the past month. Table 3.9 gives the component value corresponding to the answers chosen by the participant.

Table 3.9. Values Corresponding to the Question Seven Answers

Answers	Component 6 Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Component seven gives information about daytime dysfunction. It is obtained by using questions eight and nine. Question eight was asked to find out how often the participants struggled to stay awake during their activities of daily life in the past month, and the ninth question was asked to find out during the past mount how much of a problem has it been for participants. Table 3.10 shows the values corresponding to the answers to questions eight and nine. Table 3.11 gives the component value corresponding to the sum of the values of questions eight and nine.

Table 3.10. Value of Answers to the Question Eight and Nine

Q:8		Q:9	
Response	**Score**	**Response**	**Score**
Never	0	**No problem at all**	0
Once or twice	1	**Only a very slight problem**	1
Once or twice each week	2	**Somewhat of a problem**	2
Three or more times each week	3	**A very big problem**	3

Table 3.11. Component Value Corresponding to the Sum of the Questions Eight and Nine

Q8+Q9	Component 7 Score
0	0
1-2	1
3-4	2
5-6	3

We calculated each component for all participants with the data we obtained from the survey. The sum of the 7 component points gives the PSQI score. The score is minimum 0, maximum 21. A high score shows poor sleep quality, a score of ≤ 5 shows "good sleep quality", and a score > 5 shows "poor sleep quality" (60).

3.2.5. Perceived Stress Scale (PSS)

The perceived stress scale was creaated by Cohen et al. in 1983 (93). A validity and reliability research was conducted by Eskin M. et al. in 2013, and it was determined that it was suitable for Turkish society (94).

The scale consists 14 items and questions from the last month. The person is questioned about how he/she feels in some situations. For each item, the person is asked to choose Never, Almost Never, Sometimes, Quite Often, or Very Often. Some questions (1, 2, 3, 8, 11, 12, 14) score is 0, 1, 2, 3, 4 respectively. The scoring of some of the questions (4, 5, 6, 7, 9, 10, 13) is reversed and it is 4, 3, 2, 1, 0.

The total score in the scale is ranges 0 to 56 points and it is evaluated over the total score. We also asked our participants to answer the questions in the survey we sent via google forms. We calculated the total PSS score for each participant based on the responses received. As the total score increases, the stress level also increases (94) (Appendix 7.)

3.3. Data Analysis

For statistical analysis of data obtained from our study, we utilized SPSS (Statistical Package for Social Sciences) Version 23.0. Quantitative variables were presented by mean, standard deviation, minimum and maximum values, qualitative variables were presented by frequency and percentage values. Information about the normal distribution of the data was obtained with the Kolmogorov-Smirnov test. As a result of the Kolmogorov-Smirnov test; data distribution was nonparametric. Among the groups determined according to three different physical activity levels; comparisons of sleep quality, perceived stress, neck pain level, and screen time were made with the Kruskal-Wallis H test with Mann-Whitney U test. The relationship between the variables we obtained was also found by applying the Spearman Correlation test. In our study, the level of significance will be taken as $p< 0.05$.

4. RESULTS

4.1. Descriptive Characteristics of Participants

This study focused on the evaluation of the effects of a sedentary lifestyle on neck pain, perceived stress, and sleep quality. Five hundered and twelve participants were involved in the research. The demographic features of participants (age, weight, body mass index) were presented in Table 4.1.

Table 4.1. Distribution of Average Age, Height, Weight and BMI of Participants

	Mean±SD	**Range (Min-Max)**
Age (years)	24.19±3.36	18-28
Weight (kg)	66.89±14.98	40-118
Height (m)	169.40±10.05	110-208
BMI (kg/m^2)	23.23±4.30	15.59-40.90

SD: Standard deviation, Min: Minimum, Max: Maximum, BMI: Body Mass Index

As a result of IPAQ-SF; participants were separated into groups as Physically inactive (TPAS <600 MET), Low physical activity level (TPAS = 600-3000 MET), and Adequate physical activity level (TPAS >3000 MET). There were 203 (39.6%) physically inactive, 224 (43.8%), low physical activity level, and 85 (16.6%) adequate physical activity level. The demographic features of the groups were presented in Table 4.2. There was no statistical difference between the physical activity level groups in terms of their gender and height ($p>0.05$). Additionally, there was a statistically significant difference between the groups in terms of their BMI and weight values ($p<0.05$). Participants in the study were from the young population and their mean BMI value was within the range classified as normal and overweight.

Table 4.2. Demographic Characteristics of Participants According to IPAQ-SF Score

	PI Mean±SD (n=203)	LPAL Mean±SD (n=224)	APAL Mean±SD (n=85)	Z	p
Age (years)	24.49±0.23	23.93±0.22	24.14±0.36	3.253	0.197
Weight (kg)	66.37±15.09	65.70±14.38	71.08±16.06	7.276	**0.026***
Height (cm)	167.43±15.22	168.72±14.58	171.27±11.24	1.971	0.373
BMI (kg/m^2)	23.36±0.31	22.79±0.27	24.07±0.45	8.318	**0.016***

BMI: Body Mass Index, PI: Physically Inactive, LPAL: Low Physical Activity Level, APAL: Adequate Physical Activity Level, SD: Standard deviation, Z: Kruksall Wallis H, *p<0.05

Table 4.3. Distribution of Participants According to Gender with Respect to IPAQ-SF Score

	PI % (n) (n=203)	LPAL % (n) (n=224)	APAL % (n) (n=85)	X^2	p
Male (n=131)	30.5% (40)	42.7% (56)	26.7% (35)	X^2=14.580	**0.001****
Female (n=381)	42.8% (163)	44.1% (168)	13.1% (50)		

PI: Physically Inactive, LPAL: Low Physical Activity Level, APAL: Adequate Physical Activity Level, X^2: Chi-Square, **p<0.001

4.2. Comparison of Screen Time, Sitting Time, NBQ, PSS and PSQI Scores of Participants According to the IPAQ - SF Score

The comparations of the Neck Bournemouth Questionnaire (NBQ) score, Perceived Stress Score (PSS), Pittsburgh Sleep Quality Index (PSQI) score, screen time, and sitting time according to IPAQ-SF groups were given in Table 4.4. The statical difference was found with the Kruskal Wallis H test between physical activity level and sitting time (p=0.001), PSS (p=0.002). Nonetheless, there were no significant differences between screen time; NBQ score, and PSQI score in terms of IPAQ-SF score.

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After this analyze, corresponding comparison techniques were used to understand which groups caused the significant difference determined after Kruskal Wallis-H. Since there is no special test technique used for this purpose, Mann Whitney-U, which is

preferred in pairwise comparisons was applied. As a result, it was determined that the statistical difference in sitting time was due to the difference between the group with adequate physical activity level and the physically inactive group (p=0.001). Later than the analysis, it was determined that the reason for the statistical difference in perceived stress level was due to the data in the physically inactive group. It was determined that there was a statistically significant difference between the physically inactive group and adequate physical activity level group (p=0.010), and between the physically inactive group and low physical activity level group (p=0.012).

Table 4.4. Comparision of Screen Time, Sitting Time, NBQ, PSS and PSQI Scores of Participants According to the IPAQ-SF Score

	PI Mean±SD (n=203)	LPAL Mean±SD (n=224)	APAL Mean±SD (n=85)	Z	p
Screen Time (hour)	6.74±0.25	6.47±0.23	6.31±0.36	0.986	0.611
Sitting Time (hour)	7.40±0.34[a]	6.24±0.27	5.31±0.46[b]	13.140	**0.001****
NBQ Score	23.80±1.02	21.27±0.87	20.18±1.43	5.170	0.075
PSS Score	29.08±0.63[a]	26.73±0.49[b]	26.32±0.75[b]	12.100	**0.002***
PSQI Score	7.17±0.22	6.92±0.18	7.89±0.40	3.023	0.221

PI: Physically Inactive, LPAL: Low Physical Activity Level, APAL: Adequate Physical Activity Level, NBQ: Neck Bournemouth Questionnaire, PSS: Perceived Stress Score, PSQI: Pittsburgh Sleep Quality Index, Z: Kruskal Wallis H, SD: Standard deviation **p<0.001, *p<0.05, [o]p<0.05

4. 3. Relationship between the NBQ, PSS, PSQI Scores, Sitting Time, Screen Time and TPAS

The association between the NBQ, PSS, PSQI, sitting time, screen time, and TPAS was investigated using correlation analysis. The relationship was shown in Table 4.5. A moderate correlation was found between the NBQ score and PSQI score (r: 0.354, p<0.001), and a moderate correlation was found between the NBQ score and PSS score (r: 0.514, p<0.001). There were moderate correlations between the PSS and PSQI (r: 0.403, p<0.001). Between screen time and sitting time; a moderate correlation was found (r: 0.322, p<0.001). Also, there was a weak negative correlation between the TPAS and NBQ (r: -0.110, p<0.05), PSS score (r: -0.188 p<0.001), sitting time (r: -0.172, p<0.001).

Additionally, there was a week correlation between screen time and NBQ (r:0.194, p<0.001), PSS score (r: 0.114, p<0.05), PSQI score (r: 0.090, p<0.001).

Table 4.5. Relationship between the NBQ, PSS, PSQI Scores, Sitting Time, Screen Time and TPAS

		NBQ Score	PSS Score	PSQI Score	Sitting time	Screen time	TPAS
NBQ Score	**r** **p**	1.000 .	.514 **.000****	.354 **.000****	.117 **.008****	.194 **.000****	-.110 **.013***
PSS Score	**r** **p**		1.000 .	.403 **.000****	.065 .141	.114 **.010***	-.188 **.000****
PSQI Score	**r** **p**			1.000 .	.070 .116	.090 **.042***	.010 .824
Sitting time	**r** **p**				1.000 .	.322 **.000****	-.172 **.000****
Screen time	**r** **p**					1.000 .	-.042 .339
TPAS	**r** **p**						1.000 .

NBQ: Neck Bournemouth Questionnaire, PSS: Perceived Stress Score, PSQI: Pittsburgh Sleep Quality Index, TPAS: Total Physical Activity Score, r= correlation coefficient,*p<0.05, **p<0.001

4.4. Relationship Between the NBQ, PSS, PSQI Scores, Sitting Time, Screen Time According to Physically Inactive Group

The relationship between the NBQ, PSS, PSQI, Sitting time, and Screen time findings in the physically inactive group were presented in Table 4.6. A moderate correlation was found between the NBQ score and PSQI score (r: 0.395, p<0.001), and a moderate correlation was found between the NBQ score and PSS score (r: 0.488, p<0.001). Additionally, a moderate correlation was found between NBQ and sitting time (r: 0.303, p<0,001), NBQ and screen time (r: 0.239, p<0.001). There were moderate correlations between the PSS and PSQI (r: 0.474, p<0.001). Between screen time and sitting time; a moderate correlation was found (r: 0.303, p<0.001).

Table 4.6. Relationship Between the NBQ, PSS, PSQI Scores, Sitting Time, Screen Time According to Physically Inactive Group

		NBQ Score	PSS Score	PSQI Score	Sitting time	Screen time
NBQ Score	**r** **p**	1.000 .	.488 **.000****	.395 **.000****	.303 **.000****	.239 **.001****
PSS Score	**r** **p**		1.000 .	.474 **.000****	.094 .181	.121 .087
PSQI Score	**r** **p**			1.000 .	.070 .116	.163 .063
Sitting time	**r** **p**				1.000 .	.303 **.000****
Screen time	**r** **p**					1.000 .

NBQ: Neck Bournemouth Questionnaire, PSS: Perceived Stress Score, PSQI: Pittsburgh Sleep Quality Index, r=correlation coefficient,*p<0.05, **p<0.001

4.5. Relationship Between the NBQ, PSS, PSQI Scores, Sitting Time and Screen Time According to Low Physical Activity Level Group

The correlation between the NBQ, PSS, PSQI, Sitting time, and Screen time findings in the low physical activity group were presented in Table 4.7. A moderate correlation was found between the NBQ score and PSQI score (r: 0.336, p<0.001), and a moderate correlation was found between the NBQ score and PSS score (r: 0.511, p<0.001). Additionally, a moderate correlation was found between PSS and PSQI (r: 0.379, p<0,001), sitting time, and screen time (r: 0.300, p<0.001). There were weak correlations between the sitting time and PSQI (r: 0.151, p<0.05). Between screen time and NBQ; a weak correlation was found (r: 0.152, p<0.05).

Table 4.7. Relationship Between the NBQ, PSS, PSQI Scores, Sitting Time and Screen Time According to Low Physical Activity Level Group

		NBQ Score	PSS Score	PSQI Score	Sitting time	Screen time
NBQ Score	**r** **p**	1.000 .	.511 **.000****	.336 **.000****	.111 .098	.152 **.023***
PSS Score	**r** **p**		1.000 .	.379 **.000****	.022 .747	.104 .119
PSQI Score	**r** **p**			1.000 .	.151 **.024***	.053 .427
Sitting time	**r** **p**				1.000 .	.300 **.000****
Screen time	**r** **p**					1.000 .

NBQ: Neck Bournemouth Questionnaire, PSS: Perceived Stress Score, PSQI: Pittsburgh Sleep Quality Index, r=correlation coefficient,*p<0.05, **p<0.001

4.6. Relationship Between the NBQ, PSS, PSQI Scores, Sitting Time, Screen Time According to Adequate Physical Activity Level Group

The correlation between the NBQ, PSS, PSQI, Sitting time, and Screen time findings in the adequate physical activity group were presented in Table 4.8. A moderate correlation was found between the NBQ score and PSQI score (r: 0.338, p<0.001), and a moderate correlation was found between the NBQ score and PSS score (r: 0.511, p<0.001). Additionally, a moderate correlation was found between PSS and PSQI (r: 0.340, p<0,001), sitting time, and screen time (r: 0.448, p<0.001).

Table 4.8. Relationship Between the NBQ, PSS, PSQI Scores, Sitting Time, Screen Time According to Adequate Physical Activity Level Group

		NBQ Score	PSS Score	PSQI Score	Sitting time	Screen time
NBQ Score	**r** **p**	1.000 .	.511 **.000****	.338 **.002****	-.077 .486	.175 .109
PSS Score	**r** **p**		1.000 .	.340 **.001****	.013 .903	.075 .496
PSQI Score	**r** **p**			1.000 .	.033 .767	.095 .385
Sitting time	**r** **p**				1.000 .	.448 **.000****
Screen time	**r** **p**					1.000 .

NBQ: Neck Bournemouth Questionnaire, PSS: Perceived Stress Score, PSQI: Pittsburgh Sleep Quality Index, r=correlation coefficient,*p<0.05, **p<0.001

5. DISCUSSION

The objective of our study is to determine the effect of a sedentary lifestyle on sleep quality, neck pain, and perceived stress levels. For this purpose, we used the IPAQ-SF to evaluate the activity level, the PSS to evaluate the perceived stress level, the PSQI to evaluate the sleep quality, the NBQ to evaluate the level of neck pain. We also questioned the time the participants spent in front of the screen and time their sitting time. As a consequence of the between-group comparison, it was found that the activity level statistically significantly affected the perceived stress and sitting time. In consequence, there was no statistically significant difference in neck pain, sleep quality, and screen time. A negative correlation was observed between total physical activity score and neck pain, perceived stress level, sitting time. While there was no significant difference in neck pain between the groups, we found that an increase in total physical activity score caused a decrease in neck pain. In the intragroup evaluations, a significant relationship between neck pain, sleep quality, and perceived stress level; a significant relationship between perceived stress level and sleep quality, and a statistically significant relationship was found between sitting time and screen time.

There was no statistically significant difference in age and height data between the groups in the grouping based on the activity levels of the participants. However, a statistically significant difference was found when BMI and weight data between the groups in the grouping based on the activity levels. The general opinion in the literature is that weight is associated with physical inactivity (95, 96). BMI is affected by both non-modifiable and modifiable variables, with vigorous physical activity standing out as the one with the best relationship with BMI in obese individuals (96).

In our current study, correlations between total physical activity score, perceived stress level, sleep quality, screen time and sitting time were evaluated. A statistically significant relationship was discovered between perceived stress level and sleep quality, also perceived stress level and neck pain. Various studies on this subject in the literature also present similar results to our findings. In a study conducted with police officers in 2011, it was reported that when the perceived stress level increased, their sleep quality

decreased significantly (97). According to research done in China, the association between perceived stress levels and sleep quality of participants between the ages of 18-30 was examined. There was a statistically significant difference between sleep quality and perceived stress level (98). A study by Zhao et al. also found a significant relationship between perceived stress and sleep quality among young adults (99). A cross-sectional study reported a relationship between perceived stress score and poor sleep quality (100). In addition, increases in the perceived stress level lead to an increase in the pain level of participants in our study. Suvinen et al. found that increases in the perceived stress level of participants affected their general health status and increased pain (101). The generally accepted information about perceived stress level, sleep quality and pain in the literature is that there is a strong relationship between sleep quality, perceived stress level and pain.

In our study, we found that increases in physical activity scores were not related to sleep quality and screen time. Qi F. et al. (2014) investigated the relationship between physical activity, screen time, depression, and sleep quality among university students in China. It has been determined that high physical activity and low screen time significantly reduce the prevalence of depressive symptoms and improve sleep quality in university students (102). Also some studies support our finding about screen time and physical activity level association (103, 104). We consider that the reason why screen time is not associated with physical activity is that we integrate technology into every aspect of life. Thanks to the developing technology, we can use many technological devices during exercise. This shows that the time spent in front of the screen can also be spent while exercising. According to another result, no significant relationship was found between physical activity and sleep quality, contrary to our findings of some studies reporting that physical activity is associated with increased sleep quality (105-107). Some studies in the literature, similar to our results, found that participating in physical activity is not sufficient to improve sleep quality (108-109). These differences may be explained by the fact that controlled experimental trials assess the short-term effects of prescribed exercise programmes on sleep quality rather than total daily physical activity. At the same time, we found that increases in total physical activity score reduced neck pain, perceived stress level and sitting time. In some studies conducted during the Covid-19 period, it has been shown that there is a negative correlation between physical activity

and sitting time (110-114).

In the present study in-group analyzes of the groups we formed according to the physical activity levels, it was determined that the screen time of physically inactive people were similar to people with low and adequate physical activity level. While physically inactive people spend time sitting in front of a screen, physically active people reach the same screen time during physical activity. We found a low relationship between sitting time and sleep quality in participants who were physically inactive and had low physical activity levels. In parallel with our findings in the literature, some studies emphasize that sleep quality increases with a decrease in sedentary time (115, 116). In participants with low and adequate physical activity level, the increase in neck pain decreases the sleep quality and increases the perceived stress level. Some studies stating that pain affects sleep quality that support our findings (117, 118). In a study conducted in 2020, it was examined the association between low back and neck pain and sleep quality in adolescents. They found a significant correlation between low back and neck pain with sleep quality (119). Recent studies report that neck pain problems lead to mild to severe sleep problems after the pain develops (17,120).

Limitations of this study: According to IPAQ-SF score classification, the distribution of participants in our groups was not equal. PI group and LPAL group had more participants than the APAL group. The number of men and women of our participants is not equal. In our study, we investigated sleep quality with a questionnaire. Since our participants were young adults, information about their profession and employment could have been collected.

Clinical Tips: For young people with high screen time, physical activity in front of the screen may be suggested. We consider that screen-integrated physical activity can have a significant impact on overall health in young people with high screen time.

6. CONCLUSION

- There was a difference between groups in sitting time and perceived stress level between groups based on different physical activity levels.
- There was no difference between the groups formed according to different physical activity levels in neck pain, screen time and sleep quality.
- There is a correlation between neck pain and sleep quality and perceived stress level.
- Increasing perceived stress levels negatively affect sleep quality.
- In the adequate activity level, there is the relationship between screen time, sitting time but is not in neck pain

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8. APPENDICES

8.1. Appendix 1. Ethical Committee Approval

T.C. YEDİTEPE ÜNİVERSİTESİ
GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR
ETİK KURULU

Versiyon No
1.0
Sayfa 1 / 2

KARAR FORMU

2.09.2021

ETİK KURUL BİLGİLERİ		
	Etik Kurulun Adı	Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu
	Açık Adres	Yeditepe Üniversitesi Diş Hekimliği Fakültesi, Bağdat Cad. No. 238 Göztepe 34728 Kadıköy, İstanbul
	İnternet Sayfası	http://goetik.yeditepe.edu.tr/
	Telefon	0216 363 60 44
	E-posta	goetik@yeditepe.edu.tr

DEĞERLENDİRİLEN BELGELER	
	Islak imzalı başvuru dosyası, CD'si ve elektronik başvuru ☒
	Araştırma başlığı ve araştırmacıların isimleri ☒
	Başvuru dilekçesi ☒
	Araştırmanın; ☒
	• Niteliği ☒
	• Önemi ve özgün değeri ☒
	• Amaç ve hedefleri ☒
	• Yöntemi ☒
	• Yönetimi ☒
	• Yaygın etkisi ☒
	• Araştırma bütçesi (Mevcutsa) ☒
	• Süresi ve uygunluğu (Zaman cetveli) ☒
	• Kaynakları ☒
	Araştırma izin belgesi / belgeleri ☒
	Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış) ☒
	Taahhütname-1 ☒ Dünya Tıp Birliği Helsinki Bildirgesinin son versiyonunun ve Sağlık Bakanlığı'nın ilgili tüm kılavuzlarının okunmasına dair taahhüt
	Taahhütname-2 ☒ Daha önce yapılmış etik kurul başvuruları mevcut olup olmadığına dair taahhüt
	Taahhütname-3 ☒ Araştırma sırasında araştırma bütçesinde yer almayan ve gönüllünün kendisine veya Sosyal Güvenlik Kurumuna ek yük getirecek hiçbir işlem uygulanmayacağına dair taahhüt
	Taahhütname-4 ☒ COVID-19 hastalarında tedavi yaklaşımları ve bilimsel araştırmalar genelgesi okunmasına dair taahhüt
	Araştırmacıların her birisine ait özgeçmiş formu ☒
	Ek belgeler (Varsa kullanılan ölçek izinleri vb.) ☒

KARAR BİLGİLERİ		
	Başvuru Numarası	202105029
	Toplantı Tarihi	21.06.2021
	Toplantı Yeri	Çevirim içi (Google Meet)
	Karar No	12

Araştırmanın Başlığı **Covid-19 sürecinde sedanter yaşamın boyun ağrısı ve uyku kalitesine etkisi**

Araştırmacılar **Dr. Öğr. Üyesi Çiğdem Yazıcı Mutlu, Fzt. Duygu Kösedağı**

BAŞVURU NUMARASI: 202105029

KARAR 2.09.2021

☒ **KABUL**	☐ **RET** ☐ *KAPSAM DIŞI (GİRİŞİMSEL)* ☐ *BİLİMSEL VE/VEYA ETİK KURALLARA AYKIRI* ☐ *BİR SORUMLU ARAŞTIRMACININ (TEZ İSE TEZ DANIŞMANI), BİR TOPLANTIYA* ***İKİ (2) ADETTEN FAZLA ÇALIŞMA BAŞVURUSUNDA*** *BULUNMASI* ☐ *KURUM İÇİ BAŞVURULARINDA* ***YEDİTEPE UZANTILI E-POSTA HESABI*** *İLE GİRİŞ YAPILMAMIŞ OLMASI* ☐ *ŞARTLI KABULDE BELİRTİLEN REVİZYONLARIN ZAMANINDA VE/VEYA İSTENİLDİĞİ ŞEKİLDE YAPILMAMIŞ OLMASI*

T.C. Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu adına
Prof. Dr. Didem ÖZDEMİR ÖZENEN
Başkan

Araştırmanın Başlığı **Covid-19 sürecinde sedanter yaşamın boyun ağrısı ve uyku kalitesine etkisi**

Araştırmacılar **Dr. Öğr. Üyesi Çiğdem Yazıcı Mutlu, Fzt. Duygu Kösedağı**

8.2. Appendix.2 Informed Consent Form

Bilgilendirilmiş Gönüllü Olur Formu

COVID-19 Sürecinde Sedanter Yaşamın Boyun Ağrısı ve Uyku Kalitesine Etkisi

Sayın Katılımcı,

Bu form içinde bulunduğumuz sürecin sonucu olan sedanter yaşamın boyun ağrısı, uyku kalitesi ve duygu durumuna etkisini araştırmak amacıyla oluşturulmuştur. Soruları tamamıyla cevaplamak ortalama "7" dakikanızı almaktadır.

Çalışma Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Bölümü tarafından Dr. Öğr. Üyesi Çiğdem Yazıcı Mutlu danışmanlığında yürütülmektedir ve Fzt. Duygu Kösedağı'nın yüksek lisans tez çalışmasıdır.

Katılım gönüllülük esasına dayalıdır. Çalışmaya katılmanız için sizden herhangi bir ücret istenmeyecek, çalışmaya katıldığınız için size ek bir ödeme yapılmayacaktır.

Çalışmadan elde edilecek veriler araştırma amacıyla kullanılacak olup kişisel bilgileriniz gizli tutulacaktır. Çalışmayla ilgili herhangi bir sorunuz olması halinde araştırmacıya e-posta adresinden ulaşabilirsiniz.

Katkılarınızdan dolayı teşekkür ederiz.
* Gerekli

1. Çalışmaya katılmayı kabul ediyorum. *

Yalnızca bir şıkkı işaretleyin.

- ◯ Evet
- ◯ Hayır

8.3. Appendix.3 Demographic Information Form

Demografik Bilgi Formu **Tarih:…../…../……**
*Zorunlu

Adınız / Soyadınız:_____

Yaşınız *:_____

Cinsiyetiniz *
Yalnızca bir şıkkı işaretleyin.

o Kadın
o Erkek

Boyunuz (cm) *:_____
Kilonuz (kg) * :_____

Medeni Durumunuz *

Yalnızca bir şıkkı işaretleyin.

o Bekar
o Evli
o Boşanmış
o Dul

Kahve tüketim oranınız nedir? *
Yalnızca bir şıkkı işaretleyin.

o Tüketmiyorum
o Her gün 1 fincan/kupa
o Her gün 1+ fincan/kupa
o Haftada 3 gün
o Haftada 1 gün
o Nadiren
o Diğer_____

Sigara kullanıyor musunuz? *
Yalnızca bir şıkkı işaretleyin.

o Hayır
o Günde 1-5 adet
o Günde 6-10 adet
o Günde 11+
o Diğer_____

Alkol kullanıyor musunuz? *
Yalnızca bir şıkkı işaretleyin.

o Hayır
o Hergün
o Haftada bir gün
o Nadiren
o Diğer_____

Düzenli olarak ilaç kullanıyor musunuz? *
Yalnızca bir şıkkı işaretleyin.

o Evet
o Hayır

Düzenli ilaç kullanıyorsanız nedir?
_____

Herhangi bir sistemik (sürekli) hastalığınız var mı? *
Uygun olanların tümünü işaretleyin.

o Yok
o Vestibular (Denge ile ilgili) hastalıklar
o Kalp damar hastalıkları (kalp yetmezliği, ritim bozukluğu, tansiyon, kansızlık vb.)
o Solunum sistemi hastalıkları (Astım, Alerji, KOAH vb.)
o İşitme ile ilgili rahatsızlıklar
o Enfeksiyon hastalıkları (bademcik iltihabı, kulak iltihabı vb.)
o Sinir sistemi hastalıkları (Vertigo, Epilepsi, Nöropati, his kaybı vb.)
o Hormonal rahatsızlıklar (Diyabet, Guatr, İnsülin direnci vb.)
o Sindirim sistemi,
o Metabolizma hastalıkları (Gastrit, Ülser vb.)
o Görme bozukluğu
o Diğer

Covid-19 geçirdiniz mi? *
Yalnızca bir şıkkı işaretleyin.

o Evet
o Hayır
o Hala COVİD pozitifim

Bir günde ekran başında kaç saat vakit harcadınız? (Bilgisayarda, tablette, telefonda, internette, televizyon izlerken, çevrimiçi oyun oynarken vb geçirilmiş süre (saat/gün)) *
_____

8.4. Appendix 4. International Physical Activity Questionnarie-Short Form (IPAQ-SF)

Uluslararası Fiziksel Aktivite Anketi Kısa Form **Tarih:…../…../……**

Adı, Soyadı:

Günlük yaşayış içinde yaptığınız fiziksel aktiviteler hakkında bilgi edinmek istiyoruz. Aşağıda son 7 gün içinde fiziksel olarak harcanan zaman hakkında sorular bulunmaktadır. Lütfen, kendinizi çok hareketli bir kişi olarak görmeseniz bile her soruyu cevaplayın. Ev ve bahçe işlerinizi, işyerinde yaptığınız aktiviteleri, bir yerden bir yere gitmek için yaptıklarınızı, boş zamanlarınızda yaptığınız egzersiz veya spor gibi aktiviteleri düşünün.

Son 7 gün içinde 10 dakika veya üstünde süren, nefesinizi hızlandıran, kuvvet gerektiren tüm yoğun faaliyetleri göz önünde bulundurun.

Son bir hafta içinde kaç gün ağır kaldırma, kazma, aerobik, basketbol, futbol veya hızlı bisiklet çevirme gibi şiddetli bedensel güç gerektiren faaliyetlerden yaptınız?

o Şiddetli fiziksel aktivite yapmadım. (3. Soruya Geçiniz)
o Haftada _____ gün

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

o Bilmiyorum/Emin değilim
o Günde _____ dakika Günde _____ saat

Geçen bir hafta içinde yaptığınız orta dereceli fiziksel aktiviteleri düşünün. Bunlar 10 dakika veya daha uzun süren, orta derece fiziksel güç gerektiren ve normalden biraz sık nefes almaya neden olan aktivitelerdir.

Son bir hafta içinde kaç gün hafif yük taşıma, normal hızda bisiklet çevirme, halk oyunları, dans, bowling veya tenis gibi orta dereceli bedensel güç gerektiren faaliyetlerden yaptınız? (Yürüme hariç.)

o Orta dereceli fiziksel aktivite yapmadım. (5. Soruya Geçiniz)
o Haftada _____ gün

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

o Bilmiyorum/Emin değilim
o Günde _____ dakika Günde _____ saat

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

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

o Yürümedim. (7. Soruya Geçiniz)
o Haftada _____ gün

Bu günlerden birinde yürüyerek genellikle ne kadar zaman geçirdiniz?

o Bilmiyorum/Emin değilim
o Günde _____ dakika Günde _____ saat

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

Son bir hafta içinde günde oturarak ne kadar zaman harcadınız?

o Bilmiyorum/Emin değilim
o Günde _____ dakika Günde _____ saat

8.5. Appendix 5. The Neck Bournemouth Questionnarie (NBQ)

Bournemouth Boyun Ağrısı Anketi **Tarih:……/…../…..**

Adı, Soyadı:

Aşağıdaki ölçekler boyun ağrınızı ve bunun sizi nasıl etkilediğini ortaya çıkarmak için tasarlanmıştır. Lütfen tüm ölçekleri, her bir ölçek üzerinde nasıl hissettiğinizi en iyi tanımlayan bir numarayı işaretleyerek cevaplayınız.

1. Geçtiğimiz hafta boyunca, boyun ağrınızı ortalama nasıl derecelendirirsiniz?

Ağrı yok **Olabilecek en kötü ağrı**

0 1 2 3 4 5 6 7 8 9 10

2. Geçtiğimiz hafta boyunca, boyun ağrınız günlük aktivitelerinizi (ev işi, yıkama, giyinme, kaldırma, okuma, araba sürme) ne kadar engelledi?

Hiç engellemedi **Yapamayacak kadar engelledi**

0 1 2 3 4 5 6 7 8 9 10

3. Geçtiğimiz hafta boyunca, boyun ağrınız eğlence (hobi), sosyal ve aile aktivitelerine katılımınızı ne ölçüde engelledi?

Hiç engellemedi **Katılamayacak kadar engelledi**

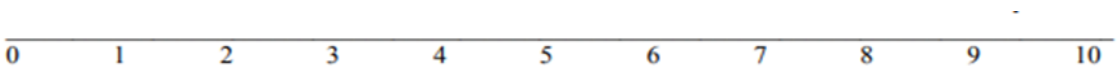
0 1 2 3 4 5 6 7 8 9 10

4. Geçtiğimiz hafta boyunca, ne ölçüde endişeli (gergin, sinirli, asabi, konsantre olmakta / gevşemekte zorluk) hissettiniz?
Endişeli değildim **Son derece endişeliydim**

0 1 2 3 4 5 6 7 8 9 10

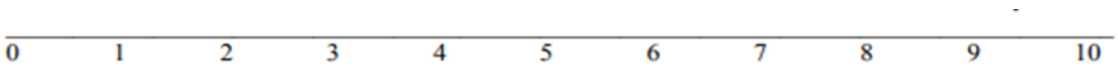
5. Geçtiğimiz hafta boyunca, ne kadar depresif (keyifsiz, üzgün, keyifsiz, kötümser, mutsuz) hissettiniz?

Depresif değildim **Son derece depresiftim**



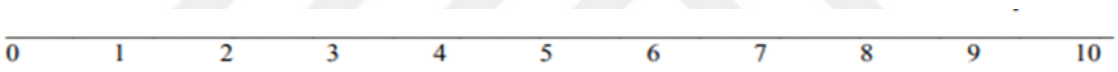
6. Geçtiğimiz hafta boyunca, işinizin (ev içinde ve dışında) boyun ağrınızı nasıl etkilediğini (ya da etkileyeceğini) hissettiniz?

Hiç etkilemedi **Oldukça kötü etkiledi**



7. Geçtiğimiz hafta boyunca, boyun ağrınızı kendi kendinize ne ölçüde kontrol (azaltmak / hafifletmek) edebildiniz?

Tamamen kontrol ettim **Hiç kontrol edemedim**



8.6. Appendix 6. Pittsburgh Sleep Quality ındex (PSQI)

Pittsburg Uyku Kalitesi Ölçeği **Tarih:……/……/……**

Adı, Soyadı:

Aşağıdaki sorulara vereceğiniz cevaplar için son bir ayı göz önünde bulundurmalısınız. Lütfen tüm soruları cevaplayın.

1. Geçen ay geceleri genellikle ne zaman yattınız?
……

2. Geçen ay geceleri uykuya dalmanız genellikle ne kadar zaman (dakika) aldı?
…….

3. Geçen ay sabahları genellikle ne zaman kalktınız?
…….

4. Geçen ay geceleri kaç saat uyudunuz (bu süre yatakta geçirdiğiniz süreden farklı olabilir.)

……..

5. Geçen ay aşağıdaki durumlarda belirtilen uyku problemlerini ne sıklıkla yaşadınız?

	Hiç	1'den az	1-2 kez	3'ten çok
a. 30 dakika içinde uykuya daldınız				
b. Gece yarısı veya sabah erken uyandınız				
c. Tuvalete gittiniz				
d. Rahat bir şekilde nefes alıp veremediniz				
e. Aşırı derecede üşüdünüz				
f. Aşırı derecede sıcaklık hissettiniz				
g. Kötü rüyalar gördünüz				
h. Ağrı duydunuz				
i. Diğer nedenler				
j. Öksürdünüz veya gürültülü bir şekilde horladınız				

6. Geçen ay uyku kalitenizi bütünü ille nasıl değerlendirirsiniz.
□ Çok İyi □ Oldukça İyi □ Oldukça Kötü □ Çok Kötü

7. Geçen hafta uyumanıza yardımcı olması için ne kadar sıklıkla uyku ilacı (reçeteli veya reçetesiz) aldınız?
□ Hiç □ 1'den Az □ 1-2 Kez □ 3'den Çok

8. Geçen hafta araba sürerken, yemek yerken veya sosyal bir aktivite esnasında ne karda sıklıkla uyanık kalmak için zorlandınız?
□ Hiç □ 1'den Az □ 1-2 Kez □ 3'den Çok

9. Geçen ay bu durum işlerinizi yeteri kadar istekle yapmanızda ne derecede problem oluşturdu?

□ Hiç problem oluşturmadı
□ Bir dereceye kadar problem oluşturdu
□ Yalnızca çok az bir problem oluşturdu
□ Çok büyük bir problem oluşturdu

10.Bir yatak veya oda arkadaşınız var mı?

□ Bir yatak partneri veya oda arkadaşı yok*
□ Partneri aynı odada fakat aynı yatakta değil
□ Diğer odada bir partneri veya oda arkadaşı var
□ Partner aynı yatakta

* Sıradaki ankete geçebilirsiniz.

11. Eğer bir oda arkadaşı veya yatak partneriniz varsa ona aşağıdaki durumları ne kadar sıklıkla yaşadığınızı sorun.

	Hiç	1'den az	1-2 kez	3'ten çok
Gürültülü horlama				
Uykuda nefes alıp verme arasında uzun aralıklar				
Uyurken bacaklarda seğirme veya sıçrama				
Uyku esnasında uyumsuzluk veya şaşkınlık				
Diğer huzursuzluklarınız				

8.7. Appendix 7. Perceived Stress Scale (PSS)

Algılanan Stres Ölçeği **Tarih:……/……/……**

Adı, Soyadı:

Aşağıdaki sorular son bir ay içindeki düşünceleriniz ve duygularınızla ilgilidir. Her bir soruda sizden bu düşünceyi ya da duyguyu ne sıklıkta yaşadığınızı belirtmeniz istenmektedir.

Bazı sorular birbirine benzer gibi görünse de aralarında farklılıklar vardır ve her soruyu ayrı bir soru olarak değerlendirmeniz gerekmektedir.

Soruları yanıtlarken son bir ay içinde ne sıkılıkta bu şekilde düşündüğünüzü ya da hissettiğinizi hesaplamaya çalışmak yerine soruyu okuduktan sonra seçenekler arasında en uygun gördüğünüz tahmini işaretlemeniz daha uygun olacaktır.

Algılanan Stres Ölçeği	Hiç	Neredeyse Hiç	Bazen	Sıkça	Çok Sık
Son bir ay içinde, beklenmedik şekilde gerçekleşen olaylardan dolayı ne sıklıkta üzüldünüz?					
Son bir ay içinde ne sıklıkta, yaşamınızdaki önemli şeyleri kontrol edemediğinizi hissettiniz?					
Son bir ay içinde kendinizi ne sıklıkta, gergin ve stresli hissettiniz?					
Son bir ay içinde, yaşamınızdaki can sıkıcı durumlarla ne sıklıkta başarılı bir biçimde baş ettiniz?					
Son bir ay içinde ne sıklıkta, yaşamınızda meydana gelen önemli değişikliklerle etkili bir biçimde başa çıktığınızı hissettiniz?					
Son bir ay içinde ne sıklıkta, kişisel sorunlarınızla baş etme yeteneğinizden emin oldunuz?					
Son bir ay içinde ne sıklıkta, işlerin istediğiniz gibi gittiğini hissettiniz?					
Son bir ay içinde ne sıklıkta, yapmak zorunda olduğunuz her şeyin üstesinden gelemeyeceğinizi düşündünüz?					
Son bir ay içinde yaşamınızdaki rahatsız edici olayları ne sıklıkta kontrol edebildiniz?					
Son bir ay içinde ne sıklıkta, yaşamınızdaki olaylara hakim olduğunuzu hissettiniz?					
Son bir ay içinde, kontrolünüz dışında gerçekleşen şeylerden dolayı ne sıklıkta öfkelendiniz?					
Son bir ay içinde ne sıklıkta, üstesinden gelmek zorunda olduğunuz şeyler üzerinde düşündünüz?					
Zamanınızı nasıl geçirdiğinizi son bir ay içinde ne sıklıkta kontrol edebildiniz?					
Son bir ay içinde ne sıklıkta, güçlüklerin, üstesinden gelemeyeceğiniz kadar çoğaldığını hissettiniz?					