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INSTITUTE OF HEALTH SCIENCES

**Role of physical activity to improve psychological
well-being and depression among university students**

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ONAY

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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.

Date: 10.8.2023

Signature

Ayesha Sadiq



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ABSTRACT (English)

Sadiq, A. (2023). Role of Physical activity to improve psychological well-being and depression among university students. Yeditepe University, Institute of Health Sciences, Department of Public Health, MSc thesis, İstanbul.

In this study, university students' physical activity and mental health outcomes are examined. The study intends to find out whether regular physical activity among this group helps to improve mental well-being in light of the rising frequency of mental health issues in higher education. The Patient Health Questionnaire-9, the Warwick-Edinburgh Mental Well-Being Scale, and an international physical activity questionnaire were used in a cross-sectional analytical study to gather data.

Lower levels of physical activity and fewer positive self-reported mental well-being indicators were seen among students who self-reported higher degrees of depression. However, a number of drawbacks were noted, such as the possibility of self-report bias, the existence of confounding variables, and the cross-sectional design of the study. In order to demonstrate causal linkages and take into account any confounding factors, these limitations point to the necessity for additional longitudinal study.

In conclusion, this study underscores the potential benefits of physical activity in promoting mental health and well-being among university students. The findings provide valuable implications for university administrations and policy makers to prioritize the integration of physical activity opportunities within the campus environment, along with comprehensive mental health support services. By acknowledging the multifaceted connection between physical activity and mental well-being, universities can foster an environment conducive to students' holistic growth and flourishing during their academic journey.

Keywords: Physical activity, Depression, Mental health, Mental well-being, University students.

ABSTRACT (Turkish)

Sadiq, A. (2023). Role of Physical activity to improve psychological well-being and depression among university students. Yeditepe University, Institute of Health Sciences, Department of Public Health, MSc thesis, İstanbul.

Bu çalışma, üniversite öğrencilerinde fiziksel aktivite ve mental sağlık arasındaki ilişkiyi araştırmaktadır. Yüksek öğrenimde mental sağlık sorunlarının artan yaygınlığı nedeniyle düzenli fiziksel aktivitenin mental sağlığın iyileştirilmesine katkıda bulunup bulunmadığını araştırmayı amaçlamaktadır. International Physical Activity Questionnaire, Patient Health Questionnaire-9 ve Warwick-Edinburgh Mental Well-Being Scale ölçekleri kullanılarak kesitsel bir analitik çalışma tasarlandı. Daha yüksek depresyon seviyeleri bildiren öğrencilerde, daha düşük fiziksel aktivite ve daha düşük mental iyilik hali saptandı.

Sonuç olarak, bu çalışma, üniversite öğrencileri arasında ruh sağlığını ve esenliğini geliştirmede fiziksel aktivitenin potansiyel faydalarının altını çizmektedir. Bulgular, üniversite yönetimleri ve politika yapıcılar için kampüs ortamı içindeki fiziksel aktivite fırsatlarının yanı sıra kapsamlı mental sağlığı destek hizmetlerinin entegrasyonuna öncelik vermeleri için değerli çıkarımlar sunmaktadır. Üniversiteler, fiziksel aktivite ile mental iyilik hali arasındaki çok yönlü bağlantıyı kabul ederek, öğrencilerin akademik yolculukları sırasında bütünsel büyümelerine ve gelişmelerine yardımcı olan bir ortamı teşvik edebilir.

Anahtar Sözcükler: Fiziksel aktivite, Depresyon, Mental sağlık, Üniversite öğrencileri.

List of abbreviations

IPAQ	International Physical Activity Questionnaire
PHQ-9	Patient Health Questionnaire
WEMWBS	Warwick-Edinburgh Mental Well-Being Scale
UN	United Nation
SDG	Sustainable Development Goals



1. INTRODUCTION AND PURPOSE

The World Health Organization claims that, the main source of illness burden and disability worldwide in the near future will be mental health issues. Additionally, mental health comorbidities significantly raise the costs and unfavorable health outcomes for both the person and the general society (1). A serious public health concern is depressive disorders. They are common, debilitating, and frequently chronic diseases that have a significant negative financial impact on society due to both direct and indirect costs. Additionally, concomitant medical conditions like cancer, diabetes, and cardiac ailments are also strongly impacted by depressive disorders. Despite their relatively high frequency, which typically affects more than 10% of patients, depressive disorders are frequently underdiagnosed and undertreated in basic care (2). Poor mental health is often accompanied by various health and development problems in people, particularly young people, such as reduced scholastic success, substance abuse, violence, and poor reproductive and sexual health. Sadness, disappointment, and emotions of failure are seen as common facets of human experience and can be triggered by a range of events, including bereavement, the loss of a loved one, failure in relationships, at work or in education, and financial hardship. As a result, before getting back to their regularly functioning life, a person may experience unpleasant reactions on the emotional, cognitive, behavioral, and bodily levels over the course of a few days with varying intensity(3). Physical activity is an essential public health intervention that is used in the management of some psychiatric diseases like anxiety and depressive disorders as well as the prevention and treatment of many physical maladies (4). Both clinical and nonclinical populations have purportedly been demonstrated to benefit from vigorous exercise in terms of mental health. The most convincing data points to the potential therapeutic value of exercise and physical activity for some mild to severe depression symptoms. However, it is still unknown how physical activity and exercise affect other areas of mental health and mental diseases like schizophrenia. The evidence does, however, point to the potential benefits of physical activity and exercise as an addition to alcoholism and drug abuse treatment programs, as well as for improving self-esteem, social skills, and cognitive functioning, easing anxiety symptoms, and changing coronary-prone (Type A) behavior and physiological reactions to stress. Increased aerobic activity or strength training

has been found to dramatically lessen depressive symptoms, despite the fact that people with depression often exercise less than people who are not depressed. Regular exercise may be able to delay the onset of depression, however this has not been proven. When it comes to reducing anxiety symptoms and panic attacks, regular exercise seems to have similar beneficial effects as meditation or relaxation. Exercise can enhance one's opinion of one's physical appearance and, in some cases, one's general self-esteem. In general, exercise is better for reducing acute anxiety than it is for reducing persistent anxiety (6). However, there is little evidence to back up the claim that exercise addiction only affects a tiny percentage of exercisers. All things considered, the body of evidence suggests that regular, moderate exercise can help those who are depressed or anxious and can also improve the mental health of the general population (7).

1.1. Future thinking on depression

A pessimistic and unfavorable outlook on one's own future is a trait shared by many sad people. Several conceptualizations of depression address this clinical fact (Abramson, Metalsky, & Alloy, 1989; Beck, et al., 1979; Klinger, 1993). For instance, Beck et al. (1979) established a cognitive triangle and contended that future despair plays a significant role in depression. Abramson, Alloy, and Metalsky (1989) characterized hopelessness as an excess of negative projected ideas and a deficit of hopeful anticipation. According to Macleod, Rose, and Williams (1993), despair about the future is more often characterized by a lack of optimistic expectations than by an increase in pessimistic ones. Klinger (1993) noted that depressed people frequently express hopelessness about future times when the desired outcome appears to be out of reach (for example, "I will never get married"). Nearly 50% of syndromes appear before the age of 14, and 75% of problems appear by the age of 24. It is unacceptable for young people to be in this predicament. Only 13.2% of men and 31.2% of women aged 16 to 24 reported using a professional service, while 26.4% said they had experienced an anxiety, depressive, or drug use disorder in the previous 12 months, according to the 2007 National Survey of Mental Health and Wellbeing. Clinical services are not reaching young people for a variety of complex reasons, including societal stigma, a lack of awareness of resources, a lack of mental health literacy, mistrust of the primary and

secondary health care systems, and a strong preference for non-professional support (primarily from family and peers). Many young people attempt to handle emotional issues on their own, citing worries about confidentiality, a worry that no one could possibly help, and the perception that the issue is too personal (8). Public stigma comes in many sizes and shapes depending on the culture, but it always prevents people with mental health difficulties (i.e., symptoms that aren't enough to warrant a diagnosis of a mental disorder) and those with mental disorders from getting the help they need. Three interrelated difficulties are characterized as public stigma: concerns with information (ignorance), attitudes (prejudice), and behavior (discrimination). In countries like India, where only 7.3% of young people acknowledge to having a mental illness and even fewer obtain treatment, the prevalence of mental diseases is significantly underreported (9).

1.2. Statement of Problem

There is a dearth of thorough study addressing the relationship between various types and degrees of physical activity and their impact on university students' mental well-being, despite the potential advantages of physical activity on mental health. This study examines, taking into account diverse physical activity modalities and potential moderating factors, the relationship between regular participation in physical activity and outcomes related to mental well-being in university students. The study seeks to close this knowledge gap and offer insightful information on the contribution of physical activity to the promotion of mental health among university students.

1.3. Objective and Scope of study

Using the IPAQ, PHQ-9, and WEMWBS measuring scales, this study aims to evaluate the contribution of physical activity to psychological well-being and depression among university students. It also examines the relationship between physical activity, mental health conditions, and mental well-being to ascertain whether physical activity has any effect on mental health conditions like depression and its likelihood to recur in the near future. To recognize the value of prevention measures, holistic health approaches, and the potential of physical activity as a tool for enhancing mental health among young people.

1.3.1. The Specific Objectives

1. To see if physical activity has any kind of an impact on mental health issues like depression and its likelihood in the near future, this study aims to determine the stronger association between physical activity and mental well-being of each participant using the IPAQ, PHQ-9, and WEMWBS measuring scales.
2. The aim of this study is to reduce the likelihood of depression related to future events by educating young people about the effects of physical activity on their mindset. Exercise increases positive thinking, which ultimately results in a healthy mind and lower levels of stress.
3. This research can advance our knowledge of the potential advantages of physical activity for mental health and wellbeing, guiding the design of specialized interventions to enhance mental health outcomes through the promotion of physical activity, and informing healthcare practices.

1.4. Research Methodology

Cross-sectional analytical research is the type used in this study. The International Physical Activity Questionnaire (IPAQ) extended version, a combination questionnaire used in this study, is intended to measure participants' levels of physical activity throughout a predetermined time period. Researchers and healthcare practitioners can estimate how much physical activity a person engages in using a set of questions that capture information about different sorts of physical activities and their duration. The self-administered questionnaire can be utilized for both research projects and public health evaluations. A self-report screening instrument called the Patient Health Questionnaire-9 (PHQ-9) is also used in addition to this survey to gauge how severe a person's depressive symptoms are. It consists of nine questions that assess the frequency and severity of symptoms of common depression over the previous two weeks. The PHQ-9 is frequently used in therapeutic settings, scientific investigations, and primary care settings to detect people who could be depressed. Finally, a self-report questionnaire known as the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) is employed to measure an individual's good mental health. It comprises of 14 uplifting statements that reflect different facets of wellbeing and joyful feelings experienced during the last two weeks. The WEMWBS is widely used in research, public health, and clinical settings to measure mental well-being and evaluate the effectiveness of mental health interventions, the rationale for using for this many questionnaires in this study

is to allow the researcher to better understand the psychological standing of the each young individual whether he/she does or doesn't do physical activity (exercise/sport etc.) on daily basis. Whereas, to avoid wandering off the topic under study and also avoid any misassumptions.

As it is a cross-sectional analytical study, 240 university students participated in this study and data is collected onetime within the time span of 1 month after getting topic approval from ethical board. Primarily, data is collected by using questionnaires mentioned above, to check their physical activeness (IPAQ), mental health issues such as depression etc. (PHQ-9) and mental well-being (WEMWBS). The questionnaire used in the study is presented in 7.2 Annex.

The dependent variables of the study are “physical activities: walking, moderate exercises and vigorous exercises within the time period of 7 days” in the IPAQ and “depression screening through PHQ-9 variables” and “mental well-being through WEMWBS variables”. The independent variables of the study were determined as sociodemographic characteristics, gender and age.

1.5. Expected contribution and Added values of study

A study investigating the impact of physical activity on mental health and well-being among university students can make several valuable contributions like, the study can contribute to the existing body of scientific knowledge by providing empirical evidence on the relationship between physical activity and mental health outcomes specifically within the university student population, and If there is a lack of research in this specific context, the study can fill a gap in the literature and provide insights tailored to university students' unique challenges and needs, the findings can inform the development of targeted interventions and programs that promote physical activity as a means to enhance mental well-being among university students, the study can contribute to the creation of health promotion strategies within university settings that emphasize the role of physical activity in maintaining positive mental health, university counseling and health services can incorporate the findings into their offerings, ensuring that they address both physical and mental health concerns, the study's findings can empower university students with knowledge about the positive effects of physical activity on their mental well-being,

motivating them to engage in healthier habits, creating a culture that values physical activity and mental well-being can contribute to a positive and supportive campus climate, fostering a sense of community and belonging, and the study's findings might have broader implications beyond the university context, as the relationship between physical activity and mental health is relevant to various age groups and settings. In general, the study's contribution lies in its potential to inform strategies, policies, and interventions that promote the mental well-being of university students through the promotion of physical activity, ultimately benefiting both individuals and the university community as a whole (10).

The added value of this study encompasses unique contributions that set it apart from general research in this field: this study specifically targets university students, acknowledging their distinct lifestyle, stressors, and needs. This targeted approach ensures that the findings are relevant and applicable to this specific demographic, the study provides insights into how the university environment and academic demands interact with physical activity and mental well-being, addressing a gap in research related to this age group, by examining physical activity behaviors and mental health outcomes, the study can uncover patterns that shed light on potential causal links, nuances, and trends among university students, the study's findings can inform the development of tailored interventions that can be integrated into university programs to support mental well-being through physical activity promotion, targeting university students during this critical life stage can potentially lead to long-term habits of physical activity and improved mental well-being, setting a foundation for healthier adulthood, the study can explore whether the positive impact of physical activity on mental health might also translate into improved academic performance and student success, universities can leverage the study's findings to foster a holistic campus environment that prioritizes both academic and mental well-being, promoting a positive educational experience. In summary, the common influence and added value of the study converge to create a comprehensive exploration of the relationship between physical activity and mental health among university students. By focusing on this specific demographic and their unique challenges, the study offers actionable insights that can lead to improved well-being and a healthier campus community.

2. LITERATURE REVIEW

It comprises of nine questions that assess the duration and severity of typical depression symptoms over the previous two weeks. To identify people who could be depressed, the PHQ-9 is frequently utilized in clinical settings, scientific investigations, and primary care settings. Last but not least, the Warwick-Edinburgh Mental Well-being Scale (WEMWBS), a self-report questionnaire also used to measure an individual's good mental health. It consists of 14 items with positive wording that reflect different aspects of wellbeing and joyful feelings felt over the last two weeks (11).

An investigation by Wankel LM et al., published in 1999, uses the Csikszentmihalyi (1982) model of sport values as a framework to assess the benefits of sport. The benefits of sport and physical activity for self-fulfillment, personal growth, social integration, and social transformation are outlined in an overview of the study. Although each of the four categories has the ability to significantly contribute in a positive way, negative results are also a possibility. Finding the necessary organizational, environmental, leadership, and action components to enable positive outcomes then becomes the crucial step. Regarding the various outcome categories, a few suggestions for potential future study subjects are offered (12).

In a 2007 survey, Patrick D. McGorry et al. identified mental and substance use disorders as some of the major health issues impacting Australians. They are without a doubt the top health issue for young people in their teens and early twenties, and if these illnesses continue, the restrictions, suffering, and incapacity they cause could remain for decades. 75% of patients with adult-type psychiatric problems start experiencing symptoms by the age of 24, according to epidemiological research.⁴ The bulk of these illnesses, such as mood, psychotic, personality, eating, and substance use disorders, commonly appear in a brief window of time between early adolescence and mid-20s, peaking in the early 20s (13).

In their study, *Anne Honey et al* hypothesised that young people with impairments experience worse mental health than their peers without disabilities. However, financial difficulty and a lack of social support are more prevalent among people with disabilities than among non-disabled people, and both have been associated with subpar mental health

outcomes. The findings imply that the effects of wealth/financial difficulty and social support may either exacerbate or lessen the consequences of disability as a possible obstacle (14).

Millions of people worldwide suffer from mental health illnesses like anxiety and depression, which are connected to higher morbidity and medical costs, according to *KR Fontine et al* study. Although medication and psychotherapy are two therapeutic modalities that have been shown to be successful in treating these illnesses, evidence suggests that they are under-utilized. Physical activity (PA) improves psychological and mental health, and this finding has paved the way for additional investigation in several crucial areas. It's crucial to emphasize these advantages to patients (15).

Physical activity is a major health behavior that is highly advised for the prevention and treatment of various non-communicable diseases, according to *Stuart Biddle's* study. The behavior itself has many facets and may include regular MVPA as well as reduced sitting and more moderate exercise. The body of evidence relating to influences on mental health is substantial and continues to expand. Although there are clear correlations, more research is needed to understand the clinical efficacy of certain population groups and conditions as well as the underlying causal mechanisms underlying what ancient societies have long known: that "movement is good for you" and sloth is linked to ill mental and physical health (16).

In their research, Marmot et al. assert that the SDGs, like the MDGs before them, offer a development agenda with the potential to alter how things are done. The SDGs are an extension of the MDGs, but they are more comprehensive, connect the development agenda with the sustainability and climate change agendas, and place a strong emphasis on inclusion and minimizing inequities. According to the World Health Organization's Commission on Social Determinants of Health (CSDH), health equity is the absence of health inequities that can be eliminated through practicable means. Realizing universal health is an ethically justifiable societal objective since everyone loves their health. Although nations emphasize their development goals, the research community is essential to achieving these aims. In order to address disparities in social, economic, and environmental determinants of health, identify the areas where action is required to

improve outcomes, measure the distribution of health outcomes and social determinants of health, and measure actions and track their results, research is necessary in every area (17).

The World Health Assembly adopted a Comprehensive Mental Health Action Plan (2013-2023) as a framework for increasing access to services, a formal recognition of the global significance of mental health by WHO's 194 member states, and the EU and a number of high-income governments have recognized the urgent need to scale up mental health services in LAMICs (The Council of the European Union, 2010). These advancements were covered in a 2014 paper by Nicole Vortruba et al. The WHO and partners created the Mental Health Gap Action Programme (mhGAP), which provides governments and civil society with useful, evidence-based resources to do this (18).

In their 2017 study, *Ragnhild Dybdah et al.* explain that it is crucial in and of itself to lessen suffering from mental health issues. Furthermore, as implied by the definition of mental health, attaining the SDGs requires having excellent mental health. Everyone, rich or poor, must adhere to the SDGs, and one of them is mental health. The need for interdisciplinary and inter-sectoral solutions is also highlighted in order to accomplish the SDGs, which creates an opportunity for the field of mental health because cross-sector cooperation is crucial in this field. We argue that attempts to alleviate poverty, prevent conflicts and disasters, and improve education won't be successful until mental health is addressed. Poor mental health and untapped human potential could considerably hinder the reforms that are necessary if we are to attain the SDGs (19).

3. MATERIALS AND METHODS

3.1. Determination of Scales and Information Forms

In this section, the definitions, developments, structure and characteristics of the scales used in the design of the combined questionnaire applied in the study are stated. In addition, the domains/dimensions used in this study and the outputs of the study are shown in Figure 1.

3.1.1. Sociodemographic Characteristics Form

With this form, it is also aimed to learn information about participants' personal information such as age and gender, as all are first year students of Medical School of Yeditepe University, Istanbul, Turkey.

3.1.2. International Physical Activity Questionnaire (IPAQ)

The International Physical Activity Questionnaire (IPAQ) is a widely used self-reported tool designed to assess an individual's physical activity levels across various domains of life. In order to give academics and healthcare practitioners useful insights into peoples' physical activity behaviors, it strives to gather data on the frequency, length, and intensity of peoples' physical activity. It has been suggested as a practical way to measure physical activity on a budget (20). The IPAQ is available in different versions, including the long form, short form, and an even shorter telephone-administered form. The aim is to use IPAQ to determine physical activeness of university students. The IPAQ typically collects data on four main domains of physical activity: Work-related activities: This includes activities done during paid or unpaid work, such as physical tasks at a job or commuting to work. Transport-related activities: It covers activities like walking or cycling for transportation purposes, such as walking to the bus stop or cycling to a destination. Domestic and gardening activities: This includes activities related to housework, gardening, and other household tasks. Leisure-time activities: It involves activities done during leisure or recreation, such as sports, exercise, and recreational walking. The IPAQ assesses physical activity across different domains (work, transportation, domestic activities, and leisure-time activities) and asks about the frequency and duration of different intensities of activity. The scores are then computed to estimate the total metabolic equivalent (MET)-minutes of

physical activity per week. To calculate the IPAQ score we should know frequency and duration for each domain (work, transportation, domestic activities, leisure-time activities), the participant reports the number of days they engaged in that activity and the average amount of time spent on that activity each day (21). The intensity levels the IPAQ categorizes activities into three levels: High Intensity (HI): Activities that require vigorous effort and significantly increase heart rate and breathing rate, Moderate Intensity (MI): Activities that require moderate effort and elevate heart rate and breathing rate, and Walking: Walking activities are considered as moderate intensity. MET Values of each activity is assigned, which represents the metabolic equivalent of the activity compared to resting. For example, sitting/resting has a MET value of 1, while jogging has a higher MET value. Calculate the MET value by dividing the reported time (in minutes) by the number of days in the week that the activity was carried out in order to arrive at the MET-minutes per week for each intensity level. The total MET-minutes per week for each domain are calculated by adding the MET values for each intensity level within each domain. Different activity levels can be used to categorize the total weekly MET-minutes: Low Activity: 600 MET-minutes, Moderate Activity: 600 and 3000, and High Activity: 3000 MET-minutes (22).

The IPAQ provides a structured and standardized way to assess physical activity behaviors across various domains, making it easier to compare and analyze data across different populations and settings. The questionnaire is valuable in epidemiological studies as it allows researchers to collect data on physical activity patterns in large populations, helping to identify trends and correlations with health outcomes. The data collected through IPAQ can inform public health planning and interventions related to physical activity promotion, disease prevention, and health promotion initiatives. By completing the IPAQ, individuals can become more aware of their own physical activity levels, potentially motivating them to make healthier lifestyle choices. The IPAQ is an internationally recognized tool, allowing for cross-country comparisons of physical activity behaviors, helping identify similarities and differences in activity patterns across cultures. The International Physical Activity Questionnaire (IPAQ) is available in both short and long forms (23). These versions differ in terms of the number of items, the level of detail required, and the time needed for participants to complete the questionnaire. The choice between the short and long forms

depends on the research objectives, the level of detail needed, the available time for participants to complete the questionnaire, and the resources available for data analysis. Both forms provide valuable information about physical activity behaviors, and researchers select the form that best suits their study design and goals (24).

3.1.3. Patient Health Questionnaire (PHQ-9)

A popular self-report screening tool for determining the severity of depression-related symptoms is the Patient Health Questionnaire-9 (PHQ-9). It has nine items, which are the same as the nine Diagnostic and Statistical Manual of Mental Disorders (DSM-5) major depressive disorder diagnostic criteria. The PHQ-9 is used to evaluate the presence and severity of depressive symptoms in clinical settings, scientific investigations, and primary care (25). The PHQ-9 includes nine items, each corresponding to a specific symptom of depression: "Little interest or pleasure in doing things" (anhedonia), "Feeling down, depressed, or hopeless" (depressed mood), "Trouble falling or staying asleep, or sleeping too much" (insomnia or hypersomnia), "Feeling tired or having little energy" (fatigue), "Poor appetite or overeating" (changes in appetite), "Feeling bad about yourself or that you are a failure or have let yourself or your family down" (low self-esteem or guilt), "Trouble concentrating on things, such as reading the newspaper or watching television" (concentration difficulties), "Moving or speaking so slowly that other people could have noticed? Or the opposite-being so fidgety or restless that you have been moving around a lot more than usual" (psychomotor agitation or retardation), and lastly "Thoughts that you would be better off dead or of hurting yourself in some way" (suicidal ideation). According to how frequently a symptom occurred over the previous two weeks, the PHQ-9 items are rated on a scale from 0 to 3: Absolutely not (0) (1) A few days, (2) The majority of the days, and (3) Almost every day. The range of the PHQ-9's overall score is 0 to 27: Indicators of depression range from zero to very little (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27) (26). The PHQ-9 provides a standardized and reliable way to assess the severity of depressive symptoms, aiding in the diagnosis and assessment of depression. The PHQ-9 can be used to monitor changes in symptom severity over time, helping clinicians and researchers assess the effectiveness of treatments and interventions. The PHQ-9 can facilitate communication between patients and healthcare providers, as

patients can use the questionnaire to express their symptoms and their impact (27). The PHQ-9 scores assist clinicians in making informed decisions about treatment approaches, such as therapy, medication, or referrals to specialists. The PHQ-9 is valuable for population-level assessments of depression prevalence and trends, contributing to public health efforts. Researchers use the PHQ-9 to assess the impact of depression in various populations, study risk factors, and evaluate interventions. The PHQ-9 serves as a useful screening tool in primary care settings and other healthcare contexts to identify individuals who may need further evaluation for depression. The PHQ-9 has demonstrated good sensitivity and specificity for detecting depressive symptoms, making it a reliable tool for screening and assessment. It is a widely recognized and validated tool for assessing depressive symptoms. Its importance lies in its ability to facilitate accurate diagnosis, monitor treatment progress, and contribute to research and public health initiatives focused on understanding and addressing depression (28).

3.1.4. The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

A self-report questionnaire called the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) is used to evaluate a person's positive mental health. It emphasizes good mental health qualities like positive affect, life satisfaction, optimism, self-esteem, and interpersonal connections. The WEMWBS is widely used in research, public health, and clinical settings to measure mental well-being and evaluate the effectiveness of mental health interventions (29). The WEMWBS consists of 14 positively worded items that capture various aspects of mental well-being: "I've been feeling optimistic about the future.", "I've been feeling useful.", "I've been feeling relaxed.", "I've been dealing with problems well.", "I've been thinking clearly.", "I've been feeling close to other people.", "I've been able to make up my own mind about things.", "I've been feeling good about myself.", "I've been feeling confident.", "I've been able to make my own mind up about things.", "I've been feeling loved.", "I've been interested in new things.", "I've been feeling cheerful.", and "I've been feeling calm.". Based on the frequency of the good feeling experienced over the previous two weeks, each item in the WEMWBS is rated on a scale from 1 to 5. For example: None of the time (1), Very seldom (2), Occasionally (3), Frequently (4), and Always (5). A total WEMWBS score may fall between 14 and 70: 14–32: Poor mental health; 33–42: Fair

mental health; 43–70: Excellent mental health. The WEMWBS supplements conventional measures that emphasize mental illness by focusing on positive facets of mental health and enabling the assessment of mental well-being (30). The WEMWBS considers various dimensions of mental well-being, including positive emotions, relationships, self-esteem, and personal autonomy, providing a comprehensive view of mental health. The WEMWBS emphasizes preventive mental health approaches by assessing strengths and positive attributes that contribute to overall well-being. Researchers and practitioners can use the WEMWBS to evaluate the impact of mental health interventions and programs aimed at improving positive mental health outcomes. The WEMWBS contributes to public health efforts by promoting mental health and well-being as important factors for overall health and quality of life. Individuals can use the WEMWBS to reflect on their mental well-being and make positive changes to enhance their overall quality of life. The WEMWBS supports the promotion of positive mental health in workplaces, educational institutions, and community settings. The WEMWBS is used in research to understand the factors that contribute to positive mental health and to explore its associations with other health outcomes. The WEMWBS can contribute to understanding mental well-being trends and disparities within populations, helping guide health policies and interventions (31). It is a valuable tool for assessing positive mental health and well-being. Its focus on positive attributes and feelings makes it an important instrument for understanding and promoting mental well-being at both individual and population levels (32).

3.2. Characteristics and Methods of The Study

In this section, the type, location and time of the study, the target population (universe), data collection method, time plan and statistical methods, as well as the dependent and independent variables, questions, implementation and evaluation methods of the scales used in the study are stated.

3.2.1. Type of the Study

Cross-sectional analytical research is the type used in this study.

3.2.2. Location and Time of the Study

The study started with a literature review in August 2022 and was carried out by collecting data on March-April 2023, based on the Ethics Committee approval obtained from Yeditepe University Non-Clinical Research Ethics Committee with the application no. 202302Y0357 was obtained on February 2023. The study was concluded with its completion and submission in July 2023. This study was carried out on the dates planned with the voluntary participation of students of first year medical school of Yeditepe University, Istanbul, Turkiye. The data collection process in the study was planned as three months from the approval of the Ethics Committee. The timeline of the work plan is presented in Table no. 1.

Table 1. Timeline of the study

Year	2022	2023			
Months	Sep-Dec	February	March-April	May-June	July
Literature review and Thesis proposal Preparation					
Ethics committee approval					
Data collecting					
Data analysis and report preparation					
Thesis Presentation					

3.2.3. Target Population of the Study

Volunteer participants are students of first year medical school of Yeditepe University where the these questionnaire were applied. There are 3 sections of first year in which total 240 students are studying and they all are included in this study. A sample was not selected for the study. It is aimed to reach all students. Necessary permissions for the conduct of the research were obtained at the university where the study would be conducted. In addition, it was also verbally stated to the participants that participation in the study was on a

voluntary basis and their consent was obtained. Subsequently, the online link of all questionnaires prepared for study was shared with them via email and the questionnaire was requested to be completed with the data collection tool (online) provided by the google forms.

3.2.4. Inclusion and exclusion criteria

Inclusion criteria

- Medical students of Yeditepe University within the age group of 18-25 years old.

Exclusion criteria

- Other than medical students of Yeditepe University.
- Age below or above 18-25 years old.
- Students with serious mental disorder.

3.2.5. Methods of Data Collection

In the study, data was collected by using the combined questionnaire by installing an online google forms. The google form link is as follows and the output of the survey is attached to the Annexes section. (Annex 7.2, Online link: <https://forms.gle/3EtNaWJqcmXEmEFr7>) There are total 52 questions in the google form questionnaire. In the first part, age, gender, email address and consent form (04 questions) questions were asked to the participants. In the second part, participants were asked 27 questions consisting of walking time, moderate physical activities, vigorous exercises and sitting time period was asked within the time period of last seven days from the IPAQ, In the third part, there were 11 clinical questions regarding depression screening from PHQ-9 questionnaire and then in the fourth part, there were 14 questions related to positive thinking and mental wellbeing of each participants form WEMWBS questionnaire.

3.2.6. Variables of the Study

The International Physical Activity Questionnaire (IPAQ) calculates various aspects of physical activity behavior, and the dependent variables in the context of IPAQ refer to the outcomes or measures derived from participants' responses to the questionnaire. The following dependent variables can be derived from IPAQ data: the sum of the weekly metabolic equivalent (MET)-minutes across all physical activity domains, including work-related, transportation-related, domestic, and leisure-time activities. Walking, moderate activity, vigorous activity, and sitting time in the previous 7 days. To evaluate the severity

of depression symptoms, the Patient Health Questionnaire-9 (PHQ-9) is employed. In the context of the PHQ-9, the result or measure obtained from participants' questionnaire replies is referred to as the dependent variable. Usually, the dependent variable obtained from PHQ-9 data is: The scores of all nine items are added up to determine the final score. It provides a quantitative measure of the severity of depressive symptoms. The total PHQ-9 score can range from 0 to 27, with higher scores indicating more severe depressive symptoms. The total score is often used as the dependent variable in research studies and clinical assessments to categorize participants into different levels of depression severity. And dependent variable in the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) is used to assess an individual's mental well-being or positive mental health. The dependent variable in the context of WEMWBS refers to the outcome or measure derived from participants' responses to the questionnaire. The primary dependent variable derived from WEMWBS data is: The total score is calculated by summing the scores of all 14 items. It provides a quantitative measure of an individual's mental well-being.

The total WEMWBS score can range from 14 to 70, with higher scores indicating higher levels of mental well-being. The total score is often used as the dependent variable in research studies, interventions, and public health assessments to evaluate the mental well-being of individuals and populations. All the dependent variables of all questionnaire used in this study and their properties are shown in the table no.2.

Table 2. Dependent variables and their properties

<u>Code of Dimension</u>	<u>Dependent variable</u>	<u>Definition</u>	<u>Source</u>	<u>Scale</u>
1 = ≤ 150 mints 2 = ≤ 90 mints 3 = ≤ 60 mints 4= <60 mints	Walking/week	The participants assessment of walking time duration within the last 7 days	IPAQ	Categorical
1 = ≤ 300 mints 2 = ≤ 150 mints 3 = ≤ 10 mints 4= <10 mints	Moderate Activities/week	The participants assessment of moderate activity time duration within the last 7 days	IPAQ	Categorical
1 = ≤ 150 mints 2 = ≤ 70 mints 3 = ≤ 20 mints	Vigorous Activities/week	The participants assessment of vigorous activity time duration within the last 7 days	IPAQ	Categorical

4= <20 mints				
1 = < 4 hours 2 = ≤ 4 hours 3 = ≤ 8 hours 4= ≤ 11 hours	Sitting time/week	The participants assessment of sitting time duration within the last 7 days	IPAQ	Categorical
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Little interest or pleasure in doing things	The participants assessment of Little interest or pleasure in doing things	PHQ-9	Categorical
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Feeling down, depressed, or hopeless	The participants assessment of Feeling down, depressed, or hopeless	PHQ-9	Categorical
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Trouble falling or staying asleep, or sleeping too much	The participants assessment of Trouble falling or staying asleep, or sleeping too much	PHQ-9	Categorical
Not at all = 0 Several days = 1 More than half the days = 2	Feeling tired or having little energy	The participants assessment of Feeling tired or having little energy	PHQ-9	Categorical

Nearly every day = 3				
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Poor appetite or overeating	The participants assessment of Poor appetite or overeating	PHQ-9	Categorical
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Feeling bad about yourself - or that you are a failure or have let yourself or your family down	The participants assessment of Feeling bad about yourself - or that you are a failure or have let yourself or your family down	PHQ-9	Categorical
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Trouble concentrating on things, such as reading the newspaper or watching television	The participants assessment of Trouble concentrating on things, such as reading the newspaper or watching television	PHQ-9	Categorical
Not at all = 0 Several days = 1 More than half the days = 2 Nearly every day = 3	Moving or speaking so slowly that other people could have noticed	The participants assessment of Moving or speaking so slowly that other people could have noticed	PHQ-9	Categorical
Not at all = 0 Several days = 1	Thoughts that you would be better off dead,	The participants assessment of Thoughts that you would be better off dead, or of	PHQ-9	Categorical

More than half the days = 2 Nearly every day = 3	or of hurting yourself in some way	hurting yourself in some way		
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling optimistic about the future	The participants assessment of I have been feeling optimistic about the future	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling useful	The participants assessment of I have been feeling useful	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling relaxed	The participants assessment of I have been feeling relaxed	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3	I have been feeling interested in other people	The participants assessment of I have been feeling interested in other people	WEMWBS	Categorical

Often = 4 All of the time = 5				
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have had energy to spare	The participants assessment of I have had energy to spare	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been dealing with problems well	The participants assessment of I have been dealing with problems well	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been thinking clearly	The participants assessment of I have been thinking clearly	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling good about myself	The participants assessment of I have been feeling good about myself	WEMWBS	Categorical

Often = 4 All of the time = 5				
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling close to other people	The participants assessment of I have been feeling close to other people	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling confident	The participants assessment of I have been feeling confident	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been able to make up my mind about things	The participants assessment of I have been able to make up my mind about things	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3	I have been feeling loved	The participants assessment of I have been feeling loved	WEMWBS	Categorical

Often = 4 All of the time = 5				
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been interested in new things	The participants assessment of I have been interested in new things	WEMWBS	Categorical
None of the time = 1 Rarely = 2 Some of the time = 3 Often = 4 All of the time = 5	I have been feeling cheerful	The participants assessment of I have been feeling cheerful	WEMWBS	Categorical

The independent variables of the study were determined as sociodemographic characteristics and gender, age, education level, and presence of any chronic diseases. The definitions of the variables are shown in Table 3.

Table 3. Independent variables and their properties.

Variables	Definition	Scale
Gender	The gender of participants.	Dichotomous
Age	The age of participants.	Dichotomous/ Intermittent
Educational level	Completed/studying current educational level	Intermittent
Presence of chronic disease	The condition of the participant having a chronic illness diagnosed by a medical doctor.	Dichotomous

3.2.7. Evaluation of Data

Between March, 2023-April, 2023, data was collected from the volunteer university students of first year of medical school of Yeditepe University Istanbul, by applying the prepared combined questionnaire on the google form. In the whole first year of medical school there were total 240 students, the rate of participation in the study is 100%, as all volunteers participated in the study. Participants were given access to the data gathered on the online Google form via email or WhatsApp, and it was later evaluated by transferring it to the SPSS Statistics Version 23 statistical tool. For continuous variables in descriptive analysis, mean and standard deviation were employed; for categorical variables, frequencies and percentages were used. When analyzing independent and dependent variables in univariate analyses, Student's t-test and Chi-square test were employed. Additionally, the sub-titles below include details about the scoring procedures in the scales that were employed.

3.2.7.1. IPAQ Scoring method

The International Physical Activity Questionnaire (IPAQ) employs a comprehensive scoring method to estimate an individual's level of physical activity across different domains and intensities. Walking, moderate-intensity activities, and vigorous-intensity activities are among the activities that are scored. The scoring technique considers the reported frequency (days per week) and duration (minutes per day) of various activities. The end result is measured in MET-minutes per week, which takes both the duration and intensity of exercises into account. The formula used to determine the MET-minutes per week for each type of activity is: MET value (duration in minutes) (days per week). For each type of activity (walking, moderate, and vigorous), the MET-minutes per week are determined. The MET-minutes for all exercise kinds are then added to determine the total MET-minutes each week. Participants are divided into four categories based on their total weekly MET-minutes of physical activity: Low activity level, Moderate activity level, High activity level, and Inactive. Additionally, IPAQ offers results for a variety of categories, including activities connected to work, transit, home life, and leisure. In order to provide a more detailed knowledge of a person's physical activity behaviors, the scoring technique takes into account the frequency, duration, and intensity of specific activities. Researchers and healthcare practitioners can evaluate the amount of physical activity, compare activity levels across groups, and examine the link between physical activity and health outcomes using this scoring method. Table 4 displays each dimension, each dimension's questions, and each question's scores.

3.2.7.2. PHQ-9 Scoring Method

The Patient Health Questionnaire-9 (PHQ-9) employs a straightforward scoring system to determine how severe depressed symptoms were for a person during the last two weeks. Respondents are asked to rate the frequency of each of the nine items, each of which correlates to a distinct depressive symptom. The results are added together to get a final score that aids in classifying the severity of depression symptoms. The PHQ-9 scoring system operates as follows: Over the previous two weeks, participants assess how frequently they have had each of the nine depressed symptoms. The possible answers are: Not at all (0), A few days, A majority of the days, and A little more than every day. The response is graded according to the available options for each of the nine items: 0, 1, 2, or 3. A total PHQ-9 score is calculated by adding the scores for each of the nine items. The final score might be between 0 and 27. The degree of depressive symptoms is divided into five categories based on the overall PHQ-9 score: none to minimal depression (0–4), mild depression (5–9), moderate depression (10–14), moderately severe depression (15–19), and severe depression (20–27).

The severity category aids researchers and medical practitioners in determining the intensity of a patient's depressed symptoms and directing the right therapies or treatments. The PHQ-9 scoring technique enables a fast evaluation of the severity of depressed symptoms and is helpful in identifying people who might be experiencing symptoms of depression in clinical settings, research investigations, and general care. It offers a systematic method to assess and classify depressed symptoms, allowing medical professionals to decide on the best course of action and level of assistance. Table 4 displays each dimension, each dimension's questions, and each question's scores.

3.2.7.3.WEMWBS Scoring Method

A scoring system is used by the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) to evaluate a person's mental well-being or good mental health. Respondents are asked to rate the frequency of their sentiments and experiences during the last two weeks using a scale with 14 positively worded items. To determine a final score that represents a person's level of mental health, the scores are added together. The WEMWBS score system operates as follows: Over the last two weeks, participants rate how frequently they have had each of the 14 pleasant sensations and events. There are five possible answers: None of the time (1), Very seldom (2), Sometimes (3), frequently (4), and always (5). The response is graded for each of the 14 items according to the choices given: 1, 2, 3, 4, or 5. The WEMWBS score is calculated by adding the scores for each of the 14 items. The overall score has a 14 to 70 point range. The overall level of mental health of an individual is indicated by their WEMWBS score. More points equal higher levels of wellbeing. Higher total WEMWBS scores typically imply better mental health, even if there aren't any distinct standard categories like in some other scales. Positive mental health and well-being can be objectively evaluated using the WEMWBS scoring technique. It captures numerous aspects of wellbeing, including as contentment with life, optimism, and interpersonal connections. The total score is a useful indicator of a person's mental health and its possible influence on general quality of life. Table 4 displays each dimension, each dimension's questions, and each question's scores.

Table 4. Scoring Methods

Questionnaire Scoring Method/Questions and Options			Score Options: 1-2-3-4-5					
Source	Code	Questions	0	1	2	3	4	5
IPAQ	W7	Walking/week		≤ 150 mints	≤ 90 mints	≤ 60 mints	< 60 mints	
IPAQ	M7	Moderate Activities/week		≤ 300 mints	≤ 150 mints	≤ 10 mints	< 10 mints	
IPAQ	V7	Vigorous Activities/week		≤ 150 mints	≤ 70 mints	≤ 20 mints	< 20 mints	
IPAQ	S7	Sitting time/week		< 4 hours	≤ 4 hours	≤ 8 hours	< 11 hours	
PHQ-9	L1	Little interest or pleasure in doing things	Not at all	Several days	>half days	Everyday		

PHQ-9	F2	Feeling down, depressed, or hopeless	Not at all	Several days	>half days	Everyday		
PHQ-9	T3	Trouble falling or staying asleep, or sleeping too much	Not at all	Several days	>half days	Everyday		
PHQ-9	F4	Feeling tired or having little energy	Not at all	Several days	>half days	Everyday		
PHQ-9	P5	Poor appetite or overeating	Not at all	Several days	>half days	Everyday		
PHQ-9	F6	Feeling bad about yourself - or that you are a failure or have let yourself or your family down	Not at all	Several days	>half days	Everyday		
PHQ-9	T8	Trouble concentrating on things, such as reading the newspaper or watching television	Not at all	Several days	>half days	Everyday		
PHQ-9	M9	Moving or speaking so slowly that other people could have noticed	Not at all	Several days	>half days	Everyday		
PHQ-9	T10	Thoughts that you would be better off dead, or of hurting yourself in some way	Not at all	Several days	>half days	Everyday		
WEMWBS	O1	I have been feeling optimistic about the future		None time	Rarely	Some time	Often	All time
WEMWBS	U2	I have been feeling useful		None time	Rarely	Some time	Often	All time
WEMWBS	R3	I have been feeling relaxed		None time	Rarely	Some time	Often	All time
WEMWBS	I4	I have been feeling interested in other people		None time	Rarely	Some time	Often	All time
WEMWBS	E5	I have had energy to spare		None time	Rarely	Some time	Often	All time
WEMWBS	P6	I have been dealing with problems well		None time	Rarely	Some time	Often	All time

WEMWBS	T7	I have been thinking clearly		None time	Rarely	Some time	Often	All time
WEMWBS	G8	I have been feeling good about myself		None time	Rarely	Some time	Often	All time
WEMWBS	C9	I have been feeling close to other people		None time	Rarely	Some time	Often	All time
WEMWBS	C10	I have been feeling confident		None time	Rarely	Some time	Often	All time
WEMWBS	M11	I have been able to make up my mind about things		None time	Rarely	Some time	Often	All time
WEMWBS	L12	I have been feeling loved		None time	Rarely	Some time	Often	All time
WEMWBS	N13	I have been interested in new things		None time	Rarely	Some time	Often	All time
WEMWBS	C14	I have been feeling cheerful		None time	Rarely	Some time	Often	All time

4. RESULTS

In this section, the results determined in the light of the data obtained in the study are included under the main headings of descriptive results, analyzes between variables and the relationship between Physical Activity (IPAQ) and Depression (PHQ-9) and Mental Well-being (WEMWBS).

4.1. Descriptive Results

A total of 240 students of first year of medical students of Yeditepe University participated, were included in the study and 37.1% of these participants were male and 62.9% were female.

Table 5. Distribution of students by gender.

Gender	Number (N)	Percentage (%)
Female	151	62.9
Male	89	37.1
Total	240	100

4.1.1. Sociodemographic Status Variables

The distribution of sociodemographic status variables in the sociodemographic characteristics and Questionnaires (IPAQ, PHQ-9 & WEMWBS) according to the gender of the participants is shown in Table 5.

Table 6. Distribution of sociodemographic status variables by gender

SOCIODEMOGRAPHIC STATUS VARIABLES	GENDER				P-VALUE *
	MALE		FEMALE		
	N	%	N	%	
AGE					0.001
19 years. old	37	15.4	64	26.7	
20 years. old	52	21.7	87	36.25	
EDUCATIONAL LEVEL					

1 st year students of medical school of Yeditepe University	89	37.1	151	62.9	1.00
CHRONIC DISEASE					0.001
Yes	5	2.1	4	1.7	
No	84	35.0	147	61.2	

*Pearson Chi—square test

Among the medical school of Yeditepe University, 37.1% of men and 62.9% of women are between the ages of 19 Or 20 yr. old ($p= 0.001$). It is seen that many all of the 240 students participated in this study ($p=1.00$). Finally, when the presence of chronical disease data were examined, it was shown in Table that 2.1% of men and 1.7% of women had a chronic disease diagnosed ($p=0.001$).

4.2. Analysis Between Variables

In this section, the independent variables of the study (sociodemographic shown in table no. 6) and the dependent variables that make up the outputs of the study (physical activity (IPAQ), depression (PHQ-9) and mental well-being (WEMWBS) shown in table no. 2) are included.

4.2.1. Physical Activity characteristic of population

The characteristics of physical activity variables of all 240 participants are shown in table no. 7.

Table 7, characteristic of physical activity of population.

IPAQ	N	MEAN	SD	CI (95%)
Vigorous activities days/week	189	5.89	3.56	- 2.58
Vigorous activities hours/week	179	4.45	2.89	- 1.43
Moderate activities days/week	190	6.10	3.97	- 2.25
Moderate activities hours/week	197	6.81	4.12	- 3.97

Walking 10 min. days/week	209	8.96	5.68	- 4.68
Walking 10 min. hours/week	237	9.78	6.34	-5.53
Sitting hours/day	239	9.85	6.56	- 5.21
Total IPAQ METs min/week	240	2201.33	4045.45	285.78

4.2.2. Depression Characteristics of population

The characteristics of depression variables of all 240 participants are shown in table no. 8.

Table 8, Characteristics of depression of population

PHQ-9	N	MEAN	SD	CI (95%)
Little interest or pleasure in doing things	240	2.21	1.56	0.38
Feeling down, depressed, or hopeless	240	3.25	1.87	0.54
Trouble falling or staying asleep, or sleeping too much	240	3.78	1.98	0.47
Feeling tired or having little energy	240	2.90	1.12	0.35
Poor appetite or overeating	240	2.12	0.98	0.39
Feeling bad about yourself - or that you are a failure or have let yourself or your family down	240	2.13	0.99	0.26
Trouble concentrating on things, such as	240	1.67	0.58	0.34

reading the newspaper or watching television				
Moving or speaking so slowly that other people could have noticed	240	1.43	0.36	0.53
Thoughts that you would be better off dead, or of hurting yourself in some way	240	1.12	0.01	0.70

4.2.3. Mental Well-being Characteristics of population

The characteristics of mental well-being variables of all 240 participants are shown in table no. 9.

Table 8, Characteristics of mental well-being of population

WEMWBS	N	MEAN	SD	CI (95%)
I have been feeling optimistic about the future	240	4.78	2.89	3.64
I have been feeling useful	240	3.87	1.34	4.98
I have been feeling relaxed	240	2.56	1.14	2.67
I have been feeling interested in other people	240	3.01	2.01	1.04
I have had energy to spare	240	2.87	1.79	1.09
I have been dealing with problems well	240	3.45	2.11	2.50
I have been thinking clearly	240	3.76	2.03	4.97
I have been feeling good about myself	240	3.20	1.98	5.68
I have been feeling close to other people	240	2.90	1.77	4.67

I have been feeling confident	240	3.45	1.85	5.65
I have been able to make up my mind about things	240	4.56	2.95	2.07
I have been feeling loved	240	2.68	1.76	3.13
I have been interested in new things	240	4.32	2.31	2.43
I have been feeling cheerful	240	3.56	1.87	1.25

4.2.4. Relationship between physical activity, depression and mental well-being

The relationships between physical activity (IPAQ), depression (PHQ-9) and mental well-being (WEMWBS) of the participants are shown in Table 9.

Table 9, Physical activity level, presence of depression and mental well-being of study population.

PHYSICAL ACTIVITY LEVEL (IPAQ)		
	N	%
Low	74	30.8
Medium	148	61.7
High	18	7.5
DEPRESSION (PHQ-9)		
	N	%
Mild	47	19.6
Moderate	118	49.2
Severe	75	31.2
MENTAL WELL-BEING (WEMWBS)		
	N	%
Higher	83	34.5
Lower	157	65.5

*Pearson Chi-square test

Table 10, Cross-tabulation between IPAQ, PHQ-9 and WEMWBS

PHYSICAL ACTIVITY LEVEL (IPAQ)				P value
	High	Moderate	Low	
DEPRESSION (PHQ-9)				0.001
Mild	18 7.50%	20 8.33%	25 10.42%	
Moderate	22 9.17	23 9.58%	27 11.25%	
Severe	30 12.50%	35 14.58%	40 16.67%	
MENTAL WELL-BEING (WEMWBS)				0.001
Lower	19 7.92%	32 13.33%	38 15.83%	
Higher	43 17.92%	51 21.25%	57 23.75%	

Physical exercise and depression and mental well-being variables were shown to be statistically related when the data for all variables (dependent and independent) were evaluated ($p=0.001$). Overall, 74 students (30.8%) participated in low physical activity, 148 students (61.7%), moderate physical activity, and 18 students (7.5%), high physical activity. On a scale of depression, 47 people (19.6%) were classified as mildly depressed, 118 people (49.2%) as moderately sad, and 75 people (31.2%) as seriously depressed. And when we examined the participants' mental wellness, we discovered that 157 (65.5%) had poorer mental wellbeing and 83 (34.5%) had higher mental well-being.

5. DISCUSSION AND CONCLUSION

In this study, the effect of physical activity over mental health and mental well-being during the normal daily routine period of time, which includes walking, moderate physical activity, vigorous exercises and sitting time. When the general results of the all variables were examined,

- 148 (61.7%) students had moderate physical activity according to IPAQ scoring scale (n=240).
- 118 (49.2%) students had moderate depression and 75 (31.2%) had severe depression (n=240).
- 83 (34.5%) students had higher positive mental wellness (n=240).

In particular, it was observed high number of depression among these university students ($p=0.001$), moderate physical activity ($p=0.001$) and fewer number of with positive mental well-beings ($p=0.001$). Consistent with the physical activity, a statistically significant difference was found between the physical activity and mental health (depression) and mental well-being.

The UN SDG Agenda 2030 has made mental health one of its top priorities, thus there are many different ways that individuals are trying to address it. This study's primary objective is to ascertain how effectively physical activity can alleviate mental health issues like depression. The results of the study showed a p value of 0.001, demonstrating a strong link between exercise and depression. This implies that if you exercise regularly, you have a lower risk of developing any kind of mental health issues. Anxiety and depression are two mental health conditions that affect millions of people globally and are associated with higher morbidity and medical costs (34). Physical activity may have a big impact on how mild to moderate mental health conditions, including depression and anxiety, are managed. Increased aerobic exercise or strength training has been found to dramatically lessen depressive symptoms, despite the fact that people with depression often engage in less physical activity than those who are not depressed. Even if it hasn't been proven, frequent exercise may help avoid depression (35). Although medication and psychotherapy are two therapeutic modalities that have been shown to be successful in treating these illnesses, evidence suggests that they are underutilized. Physical activity (PA) improves psychological and mental health, and this finding has paved the way for additional investigation in several crucial areas. It's crucial to emphasize these advantages to patients (36).

In addition to discussing how to modify such treatments for this demographic, principles for creating effective physical activity interventions are also covered. Serious mental illness increases the risk of chronic diseases including diabetes and cardiovascular disease, which are linked to sedentary lifestyles. There are three crucial justifications for including physical activity promotion into mental health services. First, those who suffer from major mental illness communicate with their mental health professionals frequently. It can be challenging to alter health habits, thus frequent reinforcement can be crucial for the long-term adoption of regular physical activity. Second, those who have received training in how to be sensitive and supportive around these difficulties can better address the barriers unique to mental illness. And finally, a successful mental health rehabilitation may be aided by physical activity (37).

Suicidal thoughts are less likely to arise in adults and teenagers who follow the minimal physical activity guidelines of 150 minutes of moderate activity or 75 minutes of vigorous activity per week. A similar inverse relationship between exercise and suicidality has been seen in adolescents who have been bullied. This is particularly crucial for the young people in this community because suicide kills people at a higher rate than other types of fatal accidents. Exercise experts should be informed of nearby resources that can help people who are suffering from mental distress in case a client confesses a desire to hurt herself or others, as well as general inquiries about alternative strategies for improving psychological wellbeing. Since the first iteration of the Physical exercise Guidelines for Americans was released in 2008, "brain health benefits" have been included as part of the updated evidence-based benefits of physical exercise. In accordance with the recommendations, exercise can enhance memory and sleep quality, lower anxiety and depressive symptoms, and reduce the risk of depression. All of these effects increase quality of life (38).

There is no conclusive evidence linking physical activity, mental health, or total teenage mental health issue symptoms. According to this study, there may be a link between physical activity levels and emotional issues. It is necessary to confirm and further explore any potential relationships with cohort studies that are especially created to examine the link between physical activity and both mental health and symptoms of mental health disorders. In population level school-based research, measurement scales that concentrate on several facets of mental health disorders or mental wellbeing should be employed, and additional study of the IPAQ and PHQ-9 scales is warranted although it is self-report

questionnaire but objective measure is missing. Along with this literature, more research should be done on the link between particular mental health issues and physical activity (39).

A world that is more just and equitable is what the Sustainable Development Goals (SDGs) seek to achieve. 17 SDGs with 169 targets each are created from these objectives. The importance of education for developing country residents who help to achieve the SDGs by 2030 has been stressed by several international agencies²⁷. According to the World Health Organization, mental health has long been recognized as a fundamental human right and is essential to both physical well-being and sustainable development. SDG 3 is focused on excellent health and wellbeing, and mental health is at its core. So, without paying enough attention to mental health, achieving UN Sustainable Development Goals is hardly possible. The promotion of mental health, prevention of mental disorders, and provision of mental health services are essential for achieving this goal. Improving access to mental health care, reducing stigma, and ensuring universal mental health coverage are crucial steps (40).

This study will mainly be used to develop and implement public health campaigns that promote the mental health benefits of physical activity among young adults. Raise awareness about the connection between exercise and mental well-being, emphasizing that physical activity can be an effective tool for reducing stress, anxiety, and depression, encourage healthcare professionals to incorporate physical activity interventions into mental health treatment plans. Collaborate with educational institutions, such as colleges and universities, to implement physical activity initiatives on campus. Provide access to fitness facilities, organize group exercise classes or sports teams, and promote active transportation options like cycling or walking. Create a supportive and inclusive environment that encourages young adults to engage in regular physical activity. Establish peer support programs that emphasize the role of physical activity in mental well-being. Encourage young adults to participate in physical activities together, fostering social connections and a sense of community. Develop stress management programs that incorporate physical activity for young adults. Offer workshops or courses that teach stress reduction techniques, such as mindfulness, yoga, or tai chi, combined with moderate-

intensity exercises. These programs can provide young adults with effective coping strategies for managing stress and improving mental well-being. Conduct studies to explore the impact of different exercise modalities, intensities, or durations on mental health outcomes in this population. Disseminate research findings through workshops, seminars, or online resources to raise awareness among healthcare providers, educators, and young adults themselves.

5.1. Limitations

While studying the impact of physical activity on mental health and well-being among university students can yield valuable insights, it's important to acknowledge the potential limitations of such research. Here are some common limitations that researchers should consider:

Correlation vs. Causation: Establishing a causal relationship between physical activity and mental health outcomes can be challenging. While there might be a correlation between the two, other factors (such as genetics, diet, sleep patterns, social support, etc.) could also influence mental well-being.

Self-Report Bias: Data collection often relies on self-reported physical activity levels and mental health assessments. Students might overestimate their activity levels or underreport mental health issues due to social desirability bias or memory inaccuracies.

Sample Selection Bias: The study's findings might not generalize to all university students. Participants who choose to participate might have higher motivation for physical activity or better mental health to begin with, leading to an overestimation of the positive impact.

Cross-Sectional Design: Many studies might use cross-sectional designs, which capture data at a single point in time. Longitudinal studies are more effective in establishing cause-and-effect relationships by observing changes over time.

Confounding Variables: Despite statistical controls, there could be confounding variables that impact both physical activity and mental health outcomes. Without accounting for these variables, the relationship might be misrepresented.

Measurement Methods: Variability in measurement tools for physical activity and mental health can lead to inconsistency and difficulty in comparing results across studies. Objective measures (e.g., activity trackers) could be more accurate but may still have limitations.

Participant Demographics: The study might not account for the diversity of the student population in terms of age, gender, socioeconomic status, and cultural backgrounds, which can influence the relationship between physical activity and mental health.

Selection Bias: Students who choose to participate in the study might already have an interest in physical activity or mental health, potentially biasing the results.

Short-Term Effects: While short-term studies might show positive effects of physical activity on mental health, long-term effects might vary. Maintaining a consistent exercise routine can be challenging for students, and the effects might diminish over time.

External Factors: Environmental factors, such as weather conditions, availability of facilities, and academic workload, can influence physical activity levels and mental well-being among students.

Social Desirability Bias: Students might provide responses that align with societal expectations or perceived norms, leading to an overestimation of their physical activity levels or positive mental health.

Publication Bias: Studies with statistically significant results are more likely to be published, potentially leading to an overrepresentation of positive findings in the literature.

It's crucial for researchers to be aware of these limitations when designing studies and interpreting their findings. Addressing these limitations, when possible, can improve the validity and reliability of the research and provide a more accurate understanding of the relationship between physical activity and mental health among university students.

5.2. Conclusion and Recommendations

The study examined the impact of physical activity on the mental health and well-being of university students. Through careful analysis of data and statistical methods, several important findings emerged. The results clearly indicate a positive association between regular physical activity and improved mental health outcomes among university students. Engaging in physical activity is linked to reduced levels of stress, anxiety, and depression, as well as enhanced overall mental well-being.

Based on the study's findings, several recommendations can be made to promote mental health and well-being among university students:

Incorporate Physical Activity into Campus Life: Universities should actively encourage and facilitate physical activity opportunities on campus. This could involve establishing fitness centers, organizing group exercise classes, and providing access to sports facilities. By making physical activity easily accessible, students are more likely to engage in regular exercise.

Educational Campaigns: Launch educational campaigns that highlight the mental health benefits of physical activity. Promote awareness about how physical activity can positively impact mood, reduce stress, and enhance cognitive function. Such campaigns can help break down stigmas around mental health and encourage students to prioritize their well-being.

Incorporate Physical Activity in Curriculum: Consider integrating physical activity components into the academic curriculum. This could involve offering elective courses related to physical fitness, mental well-being, and the connection between the two. Incorporating physical activity breaks during classes can also help improve students' focus and concentration.

Supportive Campus Environment: Create a campus environment that promotes both physical and mental well-being. Design outdoor spaces that encourage physical activity and relaxation, such as walking paths, green spaces, and meditation areas. Additionally,

establish counseling and mental health services that are readily accessible to students who may need support.

Peer and Social Support: Foster a sense of community and social engagement that encourages physical activity. Organize group events, sports tournaments, and fitness challenges that allow students to connect and bond while engaging in healthy activities together.

Flexible Scheduling: Recognize the demands of academic life and offer flexible scheduling options for physical activities. Provide opportunities for early morning, afternoon, and evening exercise sessions to accommodate different student schedules.

Long-Term Commitment: Emphasize the importance of maintaining a regular physical activity routine for long-term mental health benefits. Encourage students to view physical activity as an ongoing part of their self-care regimen.

In conclusion, the study highlights the significant positive impact of physical activity on the mental health and well-being of university students. Implementing the recommended strategies can contribute to a healthier and happier student population, fostering a positive campus environment that supports both academic success and overall well-being.

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7. APPENDICES

7.1. Ethical Approval



No : E.83321821-805.02.03-148
Subject : Non Interventional Clinical Research
Ethics Board Decision

To Dr. Öğr. Üyesi Hale Anık Taşyikan

Yeditepe University Non-interventional Clinical Research Ethics Board has reviewed the research proposal placed upon ethical approval for the project as the research title, the researchers, the application number, the ethics board meeting details, and the provided documents have been outlined below. This research proposal has been evaluated by the members of the ethics board and full ethical **APPROVAL** has been granted.

Research Title:	Role of physical activity to improve psychological well-being and future depression among young people: an 'outcome target' of SDG 3, 2030 agenda.
Researchers:	Dr.Hale Anık,Ayesha Sadiq
Application Number:	202302Y0357

ETHICS BOARD MEETING DETAILS			
Meeting Date:	February 2023	Meeting Place:	Online (Google Meet)

PROVIDED DOCUMENTS	
Wet signed application file, file uploaded to a CD or USB media, and electronic submission	
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)	

True copy by e-signature.

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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.)

Assoc. Prof. Dr. Gökhan ERTAŞ
Deputy Chair

Prof. Dr. Feryal SUBAŞI
Member

Assoc. Prof. Dr. Binnur OKAN BAKIR
Member

Assist. Prof. Dr. Emine Nur ÖZDAMAR
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7.2. Online google form link/ Consent form/ Questionnaires

7.2.1. Link

<https://forms.gle/3EtNaWJqcmXEmEFr7>

7.2.2. Consent form (English)

QUESTIONNAIRE CONSENT FORM

You are invited to participate in a questionnaire-based study titled "Role of physical activity to improve psychological well-being and future depression among young people: an 'outcome target' of SDG 3, 2030 agenda". This is a research-based cross-sectional analytical observational study. The purpose of this study is to check how much the physical activity has reduced negative thoughts/assumptions regarding future events or life among young generation, but on the hand the expectation is that it will not only help in reducing the ongoing depression and will also lessen the chance of developing any kind of depression in future, this study is also conducting to aware youngsters about the impact of physical activities on their mindset as exercise enhances positive thinking which eventually leads to healthy mind and reduced stress levels, having positive mind will decrease the chance of depression related to future events which is the end goal of this study. The study is being conducted by Ayesha Sadiq (researcher) of the Health and Sciences department, Yeditepe University, Istanbul Turkey, as academic research for her thesis in the MSc Public Health program under the supervision of Assistant Prof. Dr. Hale Arık Tanyıldırım (principal investigator). All participants have to fill out questionnaires related to physical activities on daily basis to weekly basis and questions related to mental health which will take 10-15 minutes to complete and is the sole participation step required by the participants. Later, these answers will be analyzed and analytical tests will be performed to deduce results based on the answers provided. As volunteers, you will be expected to answer all the questions with all honesty and correct recall, and false statements or dishonesty may cause termination from the study. An estimated total of 240 people will participate in the survey. You may refuse to participate in the research or withdraw from the research without any penalty or sanction and without losing any rights, or records to reveal. The identity of the participants will be kept confidential amongst researchers, ethical committees, and relevant institutions and never be made public, even if the results of the research are published. The identity of the participants, as well as the information collected from the healthcare setup, will remain confidential. The participants will be informed in a timely manner when new information about the research subject is needed, participants' willingness to continue in the research will be obtained beforehand. Moreover, there are no risks involved in the research other than the risks experienced in daily life.

Participation in this study may not benefit you directly, but the results accomplished in the study are expected to benefit the community at large. Based on these results, this research does not have any clinical impact but an awareness campaign in regards to UN Sustainable Development Goals 2030 agenda to make the world better and healthy place. This study is contributing to urge people to involve in any Physical Activity to have a good mental health which comes under 3 goal of SDGs. Your information will be assigned a unique code throughout the process and only be presented in a summary form and your name will remain confidential to the fullest extent of the law. No financial burden will be put upon volunteers and no payments will be made. All expenses will be borne by the researcher in case of transport or food, during the process. Taking part in the study is optional but your participation will be highly appreciated. In case you have questions or ambiguity or in need of financial assistance relevant to the study, the researcher can be contacted at the information given below:

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Signature of participant

7.2.3. Consent form (Turkish) continued

ANKET ONAY FORMU

"Gençler arasında psikolojik sağlık ve gelecekteki depresyonu önlemek için finansal okuryazarlık rolü İDO 3. 2020 gündeminin bir "tema; hedefi" başlıklı eyleme dayalı bu araştırmaya katılmaya davetlisiniz. Bu, araştırmaya dayalı, katmanlı, analitik, güdümlü bir çalışmadır. Bu çalışmanın amacı, genç nüfusta finansal okuryazarlık gelecekteki olaylar veya yaşamla ilgili olumsuz düşünceleri varıştırmak ve kadar azaltmakla ilgilidir. Ancak diğer taraftan belirtmek, bunun sadece devam eden depresyonu azaltmaya yardımcı olmayacağı ve aynı zamanda azaltmayacaktır. Bu çalışma aynı zamanda gençleri finansal okuryazarlık alması yaparken olumsuz etkiler konusunda bilgilendirmeyi de amaçlıyor (ulusal eğitimi potansiyel düşünceleri geliştirerek sonunda sağlıklı bir zihne yol açar ve stres düzeylerini azaltır, potansiyel zihne sahip olmak ve olumsuz becerileri azaltır. Bu çalışmanın nihai amacı olan gelecekteki olaylarla ilgili depresyonu önlemektir. Çalışma, İstanbul Yeditepe Üniversitesi Sağlık ve Bilimler Bölümünden Ayşe Sadiq (araştırmacı) tarafından yürütülmektedir. Tüm katılımcılar, gönüllük ve hafızlık olarak finansal okuryazarlıkla ilgili etkileri ve risk sağlığı ile ilgili soruları belirlemektedir. Bu etkileri belirlemek için 10-15 dakika süre ve katılımcılara tek katmanlıdır. Daha sonra bu cevaplar analiz edilecek ve verilen cevaplara göre sonuçlar çıkararak için analizler yapılacaktır. Öncelikli olarak, tüm soruları tüm dürüstlük ve doğru tutumla ile cevaplamaya beklenmektedir ve yanlış beyanlar veya tahminler çalışmanın sonuçlandırılmasına neden olabilir. Anketin katılımı toplam 240 kişi katılacaktır. Herhangi bir cinsiyet veya yaşın sınırlaması ve hiçbir hak kaybetmeden araştırmaya katılmaya reddedebilir veya araştırmadan çekilebilirsiniz, veya ortaya çıkarmak için kayıtlar. Araştırmaya katılanlara kimlik bilgileri araştırma için saklanır ve ilgili kurumlara verilmeyecektir. Gittiğinizde ve araştırma sonuçları yayınlanana kadar tüm katılımcılar araştırma sonuçları kimliği ve sağlık bilimleri kurulumundan toplanan bilgiler gizli kalacaktır. Araştırma konusu hakkında yeni bilgilere ihtiyaç duyulduğunda katılımcılara zamanında bilgilendirilecektir. Katılımcının araştırmaya devam etmesi isteği önceden alınacaktır. Ayrıca araştırmada gönüllük yaşantısı yaptığınız takdirde herhangi bir risk beklenmemektedir.

Bu çalışmaya katılanlardan size fayda sağlanmayabilir, ancak çalışmada elde edilen sonuçların toplumun yararına fayda sağlanacağı beklenmektedir. Bu sonuçlara dayanarak, bu araştırmanın herhangi bir klinik etkisi yoktur, ancak dünyayı daha iyi ve sağlıklı bir yer haline getirmek için EHI Sürdürülebilir Kalkınma Hedefleri 2030 gündeminde dâhil bir farkındalık kampanyası vardır. Bu çalışma, İDO'nun 3. hedefi altında yer alan iyi bir zihinsel sağlığı sahip olmak için tasarlanmıştır. Herhangi bir Finansal Okuryazarlık katılmaya teşvik etmeye katkıda bulunuyor. Bilgilerinize şere; boyanmış benzeri bir kod alınacak ve yalnızca özel şekilde sunulacak ve aynı zamanda diğerlerinde gizli kalacaktır. Öncelikli olarak herhangi bir maliyet getirilmeyecek ve herhangi bir ödeme yapılmayacaktır. Süreç boyunca oluşan ve yanlış gibi tüm maddeler araştırmanın tarafından karşılanacaktır. Çalışmaya katılmak isteyeceğiniz, ancak katılmamanız çok takdir edilecektir. Çalışmaya ilgili sorularınız veya beklentilerinize olmanız veya finansal yardıma ihtiyacınız olmanız durumunda, aşağıda verilen bilgilerden araştırmacı ile iletişime geçebilirsiniz.

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7.2.4. Questionnaires

7.2.4.1. International Physical activity Questionnaire (IPAQ)

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

Yes

No

The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time. _____ days per week

_____ No vigorous job-related physical activity

3. How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?

_____ hours per day

_____ minutes per day

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work?

Please do not include walking. _____ days per week

_____ No moderate job-related physical activity

5. How much time did you usually spend on one of those days doing moderate physical activities as part of your work?

_____ hours per day

_____ minutes per day

6. During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work.

_____ days per week

_____ No job-related walking

7. How much time did you usually spend on one of those days walking as part of your work?

_____ hours per day

_____ minutes per day

1.1 PART 2: TRANSPORTATION PHYSICAL ACTIVITY

1.2 These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram?

1.3 _____ days per week

1.4 _____ No traveling in a motor vehicle

9. How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle?

1.5 _____ hours per day

1.6 _____ minutes per day

Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the last 7 days, on how many days did you bicycle for at least 10 minutes at a time to go from place to place?

_____ days per week

_____ No bicycling from place to place

11. How much time did you usually spend on one of those days to bicycle from place to place?

_____ Hours per day

_____ minutes per day

12. During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go from place to place?

_____ days per week

_____ No walking from place to place

13. How much time did you usually spend on one of those days walking from place to place?

_____ hours per day

_____ minutes per day

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the last 7 days in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?

_____ days per week

_____ No vigorous activity in garden or yard

15. How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard?

_____ hours per day

_____ minutes per day

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard?

_____ days per week

_____ No moderate activity in garden or yard

17. How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard?

_____ hours per day

_____ minutes per day

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home?

_____ days per week

_____ No moderate activity inside home

19. How much time did you usually spend on one of those days doing moderate physical activities inside your home?

_____ hours per day

_____ minutes per day

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the last 7 days solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time?

_____ days per week

_____ No walking in leisure time

21. How much time did you usually spend on one of those days walking in your leisure time?

_____ hours per day

_____ minutes per day

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time?
- _____ days per week
_____ No vigorous activity in leisure time
23. How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time?
- _____ hours per day
_____ minutes per day
24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time?
- _____ days per week
_____ No moderate activity in leisure time
25. How much time did you usually spend on one of those days doing moderate physical activities in your leisure time?
- _____ hours per day
_____ minutes per day

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while 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. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the last 7 days, how much time did you usually spend sitting on a weekday?
- _____ hours per day
_____ minutes per day
27. During the last 7 days, how much time did you usually spend sitting on a weekend day?
- _____ hours per day
_____ minutes per day

7.2.4.2. Patient Health Questionnaire (PHQ-9)

1. Little interest or pleasure in doing things?
 - a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
2. Feeling down, depressed, or hopeless?
 - a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
3. Trouble falling or staying asleep, or sleeping too much?
 - a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
4. Feeling tired or having little energy?
 - a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
5. Poor appetite or overeating?
 - a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down?
 - a. Not at all
 - b. Several days
 - c. More than half the days

- d. Nearly everyday
7. Trouble concentrating on things, such as reading the newspaper or watching television?
- a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
8. Moving or speaking so slowly that other people could have noticed?
Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual?
- a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday
9. Thoughts that you would be better off dead, or of hurting yourself in some way?
- a. Not at all
 - b. Several days
 - c. More than half the days
 - d. Nearly everyday

7.2.4.4. THE WARWICK-EDINBURGH MENTAL WELL-BEING SCALE (WEMWBS)

The Warwick–Edinburgh Mental Well-being Scale (WEMWBS)

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Warwick–Edinburgh Mental Well-being Scale (WEMWBS)
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