

Psychosocial Predictors of Physical Activity Levels in Medical Students

İrem Özkaynak Dağlı,¹ Ezgi Özcan,² İlayda Aktacir,²
İmran Gökçen Yılmaz Karaman¹

¹Department of Psychiatry, Eskişehir Osmangazi University Faculty of Medicine, Eskişehir, Türkiye

²Eskişehir Osmangazi University Faculty of Medicine, Eskişehir, Türkiye

ABSTRACT

The widespread prevalence of inadequate physical activity is a global public health problem. The benefits of regular physical activity at adequate levels and intensity regarding physical and mental health cannot be denied. However, with the spread of sedentary life, the number of individuals who perform physical activity at a sufficient level is decreasing. One's attitudes toward physical activity can affect how much they do it. These attitudes may also negatively affect problematic internet use by encouraging sedentary lifestyles. This study aims to investigate the relationship between psychological stress, internet addiction, and attitudes toward physical activity that affect the level of physical activity in medical students aged 18–25 years. For this purpose, an online questionnaire was designed and distributed to participants via the internet. Sociodemographic Data Form, Young Internet Addiction Test-Short Form, Depression-Anxiety-Stress Scale-21, Cognitive Behavioral Physical Activity Questionnaire, and International Physical Activity Questionnaire-Short Form were used in the survey form. A total of 186 medical students, consisting of 105 females (56.5%) and 81 males (43.5%), participated in the study. Of the participants, 37 (19.9%) stated that they performed sufficient physical activity. Internet addiction scores did not predict physical activity, whereas personal barriers, self-regulation, and outcome expectancy among attitudes toward physical activity predicted adequate physical activity levels. In conclusion, the variable that best predicts physical activity level in medical students is attitudes toward physical activity. Regular physical activity is recommended for the protection of mental and physical health. In conclusion, attitudes toward physical activity emerged as the most significant predictor of physical activity levels among medical students.

Keywords: Attitudes, physical activity, problematic internet use, outcome expectation, self-efficacy, self-regulation.

ÖZ

Tıp Fakültesi Öğrencilerinde Fiziksel Aktivite Düzeylerinin Psikososyal Yordayıcıları

Yetersiz fiziksel aktivitenin yaygın olarak görülmesi, küresel bir halk sağlığı problemi olarak karşımıza çıkmaktadır. Yeterli düzey ve yoğunlukta yapılan düzenli fiziksel aktivitenin fiziksel ve ruhsal sağlık açısından yararları yadsınmamaktadır. Ancak günümüzde sedanter yaşamın yaygınlaşması ile birlikte yeterli düzeyde fiziksel aktivite yapan bireylerin sayısı azalmaktadır. Fiziksel aktiviteye yönelik tutumlar kişinin fiziksel aktivite düzeyini etkileyeceği gibi, bu tutumların sedanter yaşamı teşvik ederek problemli internet kullanımı ile ilişkili olması da mümkündür. Bu çalışmanın amacı 18–25 yaş arası tıp fakültesi öğrencilerinde fiziksel aktivite düzeyini etkileyen psikolojik stres, internet bağımlılığı ve fiziksel aktiviteye yönelik tutumların ilişkisini araştırmaktır. Bu amaçla hazırlanan çevrim içi anket formu; Sosyodemografik Veri Formu, Young Internet Bağımlılığı Testi Kısa Formu, Depresyon Anksiyete Stres Ölçeği-21, Bilişsel Davranışçı Fiziksel Aktivite Ölçeği ve Uluslararası Fiziksel Aktivite Anketi Kısa Form'dan oluştu. Çalışmaya, %56,5'i kadın (n=105),



Cite this article as:

Özkaynak Dağlı İ, Özcan E, Aktacir İ, Yılmaz Karaman İG. Psychosocial Predictors of Physical Activity Levels in Medical Students. J Cogn Behav Psychother Res 2024; 13(0): 00–00.

Address for correspondence:

İrem Özkaynak Dağlı.
Eskişehir Osmangazi Üniversitesi
Tıp Fakültesi, Psikiyatri Anabilim
Dalı, Eskişehir, Türkiye
Phone: +90 222 239 29 79/3600
E-mail:
iremozkaynak@gmail.com

Submitted: 06.03.2024

Revised: 11.07.2024

Accepted: 16.07.2024

Available Online: 29.08.2024

JCBPR, Available online at
<http://www.jcbpr.org/>



This work is licensed under
a Creative Commons
Attribution-NonCommercial
4.0 International License.

%43,5'i erkek (n=81) olmak üzere toplam 186 tıp fakültesi öğrencisi katıldı. Katılımcıların %19,9'u (n=37) yeterli düzeyde fiziksel aktivite yaptığını belirtti. İnternet bağımlılığı skorları fiziksel aktiviteyi yordamamıştır. Yeterli fiziksel aktivite düzeyi, fiziksel aktiviteye yönelik tutumlardan kişisel engeller, öz düzenleme ve sonuç beklentisi tarafından yordanmıştır. Sonuç olarak örneklemimizde fiziksel aktivite düzeyini en iyi yordayan değişken fiziksel aktiviteye yönelik tutumlardır. Ruhsal ve bedensel sağlığın korunması için düzenli fiziksel aktivite yapılması önerilmektedir. Sonuç olarak, fiziksel aktiviteye yönelik tutumlar tıp fakültesi öğrencilerinin fiziksel aktivite düzeylerinin en anlamlı yordayıcısı olarak ortaya çıkmaktadır.

Anahtar Kelimeler: Tutumlar, fiziksel aktivite, problemlili internet kullanımı, sonuç beklentisi, öz düzenleme, kişisel düzenleme.

INTRODUCTION

The World Health Organization defines physical activity as “any bodily movement produced by skeletal muscles that requires energy expenditure.” Activities such as walking, dancing, or even doing household chores can also be physical activity. The benefits of regular physical activity performed at an adequate level and intensity in terms of physical and mental health are undeniable (World Health Organization, 2010). However, in today's world, with the widespread adoption of sedentary lifestyles, the number of individuals engaging in sufficient levels of physical activity has decreased. A report published by the World Health Organization revealed that 23% of adults and 81% of adolescents (11–17 years old) do not meet the recommended levels of physical activity (World Health Organization, 2022).

The prevalence of insufficient physical activity poses a global public health problem. Physical activity is shown as a protective factor in the prevention and treatment of noncommunicable diseases such as hypertension, coronary artery disease, dementia, breast cancer, and mental illnesses in studies (Bull et al, 2020). Approximately 7–8% of all cases of cardiovascular diseases, depression, and dementia and about 5% of type 2 diabetes cases could be prevented with increased physical activity (World Health Organization, 2022). This protective factor also prevents the risk factors of noncommunicable diseases. These diseases, in addition to their individual and social effects, burden the states in terms of society and health services. Physical activity prevents cognitive decline, enhances academic success, and maintains a healthy weight and well-being (World Health Organization, 2022).

The study conducted in Türkiye looked at the distribution of percentages across occupational groups by MET (total physical activity) level, categorizing it into low, medium, and vigorous levels, and found that 18% of physicians were vigorous in their physical activity, 56.7% were moderately

active, and 25.3% were not sufficiently active (Özdöl et al, 2018). As future medical professionals, medical students can be target to understand the physicians' unhealthy lifestyle.

Physical activity is believed to be one of the factors that can increase students' resistance to stress and their ability to cope with cognitive and emotional stress, improving their overall health (Ilić et al, 2022). Medical students generally do not meet minimum physical activity recommendations, even though they understand the impact of physical activity on the prevention and treatment of various diseases (Stratakis et al, 2024). Certain academic environments, increased responsibility, challenging exams, and time spent studying can lead to low physical activity. Physical activity is not considered a top priority, and students tend to reduce their physical activity to have extra study time (Dąbrowska-Galas et al, 2021).

From a cognitive behavioral perspective, attitudes toward physical activity depends on the individual's personal barriers, self-regulation, and outcome expectancy (Schembre et al, 2015). Personal barriers are lack of motivation and time or laziness. Planning and scheduling for exercise are considered as self-regulation dimension of the attitudes toward physical activity. Outcome expectancy of physical activity can be positive or negative: feeling good after exercise or avoiding exercise when stressed (Schembre et al, 2015). Wang and Hollet underlined the importance of cognitive dimension of the attitudes of college students toward physical activity (Wang & Hollett, 2021).

Common mental disorders such as depression and anxiety are prevalent among medical students (Aljuwaiser et al, 2023). Promoting self-esteem, cognitive functions, social relationships, and mental health, physical activity has the potential to prevent psychosocial distress among medical students (Aslan et al, 2020; Baykal & Soyupek, 2022).

Medical students' mental and physical health might be harmed due to internet addiction (Chou et al, 2005; Noroozi et al, 2021). Internet addiction is mainly associated with mental health issues such as depression, anxiety, and social withdrawal (Jenaro et al, 2007; Ko et al, 2009; Lu et al, 2011). Current studies also suggest that there is a bidirectional relationship between internet addiction and both depressive symptoms and physical health (Zhou et al, 2022). In the studies conducted, it is remarked that internet addiction is seen more frequently in those who do not do physical activity (Khan et al, 2017). At the same time, internet addiction reduces daily physical activity (Kim et al, 2015). In a study conducted with Turkish medical students, the rate of internet addiction was 26.8% (Deniz et al, 2024)

This study examines predictors of medical students' physical activity levels while determining psychological stress, internet addiction, attitudes toward physical activity, and physical activity levels of medical students.

METHODS

Research Design

Our study is a cross-sectional survey.

Participants

The study sample consists of Eskişehir Osmangazi University students who are proficient in Turkish and willing to participate, aged 18–25 years. Participants engaged in the research by accessing the online survey link between April 7, 2023, and July 7, 2023.

Data Collection Instruments

Data were collected from all participants through an online survey form created on the internet. The Sociodemographic Data Form, Young's Internet Addiction Test-Short Form (YIAT-SF), Depression-Anxiety-Stress Scale (DASS-21), Cognitive Behavioral Physical Activity Questionnaire (CBPAQ), and International Physical Activity Questionnaire-Short Form (IPAQ-SF) were used to gather research data.

Sociodemographic Data Form

Prepared by the researchers, this form aims to identify characteristics of the research sample, such as age, gender, academic year, major, living arrangements, the most frequently used device for accessing the internet, and the most common purpose for internet usage. To measure income status, the participant was asked for their income status and how they perceived it. We presented three income levels: low, moderate, and high. The participants chose the level according to how they felt about it.

Young Internet Addiction Test - Short Form (YIAT-SF)

The form was developed by Young in 1998 (Young, 1998) and later transformed into a short form by Pawlikowski and colleagues (Pawlikowski et al, 2013). It consists of 12 items and is a five-point Likert scale (1=Never, 5=Very often) aiming to measure internet addiction in different age groups. The scale does not include reverse-scored items or a cutoff point. Higher scores on the scale indicate a higher level of internet addiction. Scores can range from 12 to 60 (Pawlikowski et al, 2013). Kutlu and colleagues conducted the Turkish adaptation of the scale (Kutlu et al, 2016). Cutoff scores above 36 (≥ 37) are considered internet addiction (Pawlikowski et al, 2013; Tran et al, 2017).

Depression-Anxiety-Stress Scale (DASS-21)

Developed by Lovibond and Lovibond (1995a) to shorten the duration by selecting items from the DASS-42, DASS-21 evaluates the depression, anxiety, and stress constructs in three subscales. Each subscale consists of seven items, using a 4-point Likert scale (0=Never, 3=Always) (Lovibond & Lovibond, 1995b). The items consist of statements referring to the past week, and participants are asked to read these statements and rate the frequency of negative emotions. Higher scores on the scale indicate increased severity of emotional distress (Lovibond & Lovibond, 1995b). Sariçam (2018) conducted the validity and reliability studies of the Turkish version of DASS-21. It was concluded that the Turkish DASS-21 is a valid and reliable instrument for assessing levels of depression, anxiety, and stress (Sariçam, 2018). Moska and colleagues found that subscale cutoff scores of ≥ 14 detect depression, ≥ 14 detect anxiety, and ≥ 12 detect posttraumatic stress disorder based on the Diagnostic and Statistical Manual of Mental Disorders, fifth edition among youth under addiction treatment (Moska et al, 2023).

Cognitive Behavioral Physical Activity Questionnaire (CBPAQ)

Developed by Schembre and colleagues (Schembre et al, 2015), CBPAQ aims to determine individuals' attitudes and behaviors related to physical activity participation. Eskiler and colleagues conducted validity and reliability studies of the Turkish version (Eskiler et al, 2016). CBPAQ consists of 15 items and 3 subscales. Each item is rated on a 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). Subscales: Outcome Expectancy (CBPAQ-OE), comprised of items 1, 2, 9, 13, and 14; Self-Regulation (CBPAQ-SR), comprised of items 3, 4, 5, 6, and 8; and Personal Barriers (CBPAQ-PB), comprised of items 7, 10, 11, 12, and 15, are calculated. CBPAQ-OE is the expectation that participation in physical activity will produce positive and wanted results, such as increased energy, a sense of accomplishment, mood improvements, stress relief, and physical well-being. CBPAQ-SR is self-regulatory actions that

maintain regular physical activity, including relapse prevention strategies, making commitments and goals, prioritizing, and contingency planning. CBPAQ-PB is defined as the perceived barriers preventing the initiation or maintenance of regular PA, such as personal distractions, lack of time, lack of interest, and lack of motivation. The score for each subscale is obtained by taking the average of the scores from the relevant question items. The scale's total score is then obtained by subtracting the Personal Barriers score from the sum of the Outcome Expectancy and Self-Regulation scores (Schembre et al, 2015).

International Physical Activity Questionnaire-Short Form (IPAQ-SF)

Developed to determine the physical activity levels of participants aged 15–65 years (Craig et al, 2003), IPAQ-SF measures the levels of vigorous-intensity, moderate-intensity, and walking activities by calculating the physically active time in the last 7 days. The questionnaire consists of four separate sections and seven questions. Scores are calculated using the following formulas (Sağlam et al, 2010):

Walking MET-minutes/week=3.3 x minutes of walking x number of days walking was performed.

Moderate-intensity MET-minutes/week=4.0 x minutes of moderate-intensity activity x number of days moderate-intensity activity was performed.

Vigorous-intensity MET-minutes/week=8.0 x minutes of vigorous-intensity activity x number of days vigorous-intensity activity was performed.

Activity levels are represented by the MET score, the energy expenditure while resting. The total score of the short form indicates low physical activity if it is less than 600 MET-minutes per week, moderate physical activity if it is more than 600 MET-minutes per week, and high physical activity if it is more than 3000 MET-minutes per week. The lowest score is "0," and the score increases as the duration of activity increases (Booth, 2000; IPAQ Research Committee, 2005; Sağlam et al, 2010).

Ethical Aspect of the Research: The Ethical Committee for Social and Human Sciences Research has approved the research at Eskişehir Osmangazi University, with Decision No. 2023.04.09 dated March 22, 2023. The purpose of the research, the confidentiality of the information obtained, and the voluntary nature of participation are stated in the Personal Information Form. Informed consent was obtained from all participants online. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

RESULTS

A total of 186 medical students participated in the study. Their mean age was 22.95 ± 1.45 years. Of the participants, 105 were female (56.5%) and 81 were male (43.5%). Table 1 shows the descriptive characteristics of the participants. According to the DASS-21 cutoff scores, 20 of the participants had moderate to severe depressive symptoms (10.8%), and 3 had moderate to severe anxiety symptoms (1.6%). A total of 23 participants had moderate or more severe stress symptoms (12.4%). According to the cutoff scores of the YIAT-SF, 41 (22.0%) participants had internet addiction. When the physical activity levels were evaluated according to the IPAQ cutoff scores, 47 students had low physical activity (25.3%), 102 had mild physical activity (54.8%), and 37 had high physical activity (19.9%).

To test if different education levels affect physical activity levels, Spearman correlation analysis is repeated in preclinical (Grades 1, 2, and 3), clinical observer (Grades 4 and 5), and internship (Grade 6) levels. All three groups showed no relationship between physical activity levels and internet addiction, depression, anxiety, and stress (all $p > 0.05$). In the preclinical group ($n=42$), physical activity level was associated with CBPAQ total ($\rho=0.669$, $p < 0.001$), self-regulation ($\rho=0.687$, $p < 0.001$), and personal barriers ($\rho=-0.425$, $p=0.005$). The clinical observer group ($n=65$) showed significant correlations between physical activity levels and CBPAQ total ($\rho=0.493$, $p < 0.001$), outcome expectancy ($\rho=0.343$, $p=0.005$), self-regulation ($\rho=0.475$, $p < 0.001$), and personal barriers ($\rho=-0.373$, $p=0.002$). The clinical group ($n=79$) was similar to the preclinical group regarding the relationship between physical activity and attitudes toward physical activity: physical activity level was associated with CBPAQ total ($\rho=0.425$, $p < 0.001$), self-regulation ($\rho=0.340$, $p=0.002$), and personal barriers ($\rho=-0.450$, $p < 0.001$).

Table 2 presents the scale scores of the participants. Table 3 shows the correlation analysis of the scale scores. In the Spearman correlation analysis, physical activity level was negatively correlated with internet addiction ($\rho=-0.131$), positively correlated with the total score, outcome expectancy, and self-regulation subscale scores of the CBPAQ ($\rho=0.398$, $\rho=0.204$, $\rho=0.395$, respectively) and negatively correlated with the personal barriers subscale score of the CBPAQ ($\rho=-0.339$). There was no relationship between physical activity level and depression, anxiety, and stress levels.

Physical activity level was dummy-coded as adequate (≥ 3000 MET-min) and inadequate (< 3000 MET-min). Variables that have significant associations with physical activity in the correlation analysis were included in binary logistic regression analysis. Table 4 shows the results of univariate binary logistic regression analysis. Internet addiction scores did not predict physical activity ($p > 0.05$). Adequate physical activity level was predicted by all subscale scores and total score of the CBPAQ scale (each $p < 0.05$).

Table 1. Descriptive characteristics of the participants (n=186)

	Fre.	Per.
Age, Mean; Standard deviation	22.95	1.45
Gender		
Female	105	56.5
Male	81	43.5
Class		
1	7	3.8
2	13	7.0
3	22	11.8
4	39	21.0
5	26	14.0
6	79	42.5
Class repetition		
Yes	50	26.9
No	136	73.1
Place of residence		
At home, alone	90	48.4
At home, with family	46	24.7
At home, with a friend/friends	30	16.1
Dormitory or apartment	20	10.8
Place of residence for the longest time		
City	134	72.0
County	45	24.2
Town/village	7	3.8
Income status		
Low	12	6.5
Mild	155	83.3
High	19	10.2
Number of siblings		
No siblings	18	9.7
1	65	34.9
2	55	29.6
3	33	17.7
≥4	15	8.1
Family type		
Elementary family	169	90.9
Extended family	17	9.1
Psychometric evaluation with DASS-21 and YIAT-SF		
Depression	20	10.8
Anxiety	3	1.6
Stress	23	12.4
Internet addiction	41	22.0
IPAQ-SF level		
Low (<600 MET-minute/week)	47	25.3
Medium (600–3000 MET-minute/week)	102	54.8
High (>3000 MET-minute/week)	37	19.9

Fre.: Frequency; Per.: Percentage; SD: Standard deviation; DASS-21: Depression-Anxiety-Stress Scale; YIAT-SF: Young Internet Addiction Test - Short Form; IPAQ-SF: International Physical Activity Questionnaire-Short Form.

Table 2. Scale scores of the participants (n=186)

	Mean	SD
YIAT-SF	30.05	7.39
DASS-21 Total	18.97	10.04
DASS-21 Depression	7.13	4.45
DASS-21 Anxiety	4.77	3.49
DASS-21 Stress	7.05	3.53
CBPAQ Total	3.65	1.97
CBPAQ - Outcome Expectations	4.09	0.68
CBPAQ - Self-regulation	2.80	0.99
CBPAQ - Personal Barriers	3.24	0.85
IPAQ – Total Physical Activity (MET-minute/week)	2026.09	2589.53

SD: Standard deviation; YIAT-SF: Young Internet Addiction Test - Short Form; DASS-21: Depression-Anxiety-Stress Scale; CBPAQ: Cognitive Behavioral Physical Activity Questionnaire; IPAQ: International Physical Activity Questionnaire-Short Form.

DISCUSSION

This study researched the factors predicting adequate levels of physical activity among medical students. The primary finding of our study is that attitudes toward physical activity predict being physically active. Although psychological stress was not directly associated with physical activity levels, it had a negative association with attitudes toward physical activity.

Our study found a significant positive relationship between the level of physical activity and the CBPAQ's self-regulation and outcome expectancy subdimensions. In contrast, a negative significant relationship was found with personal barriers. These findings are consistent with a study investigating the relationship between physical activity level and physical activity awareness among university students in Türkiye (Aydın & Keklicek, 2020). Studies conducted with university students in Thailand in 2016 and in Türkiye in 2021 reported significant effects of self-efficacy, outcome expectancy, and self-regulation on physical activity (Sriramatr et al, 2016; Ayhan et al, 2021). The findings indicate that attitudes toward physical activity affect the amount of physical activity.

The inactivity levels (25.3%) of the students in our study were consistent with the literature; 54.8% engage in low levels of physical activity, and 19.9% engage in sufficient physical activity. Studies have shown that most of the medical students are physically inactive (25–40%) (Yüksel et al, 2021; Sahin, 2022; Baykal & Soyupek, 2022; Janampa-Apaza et al,

Table 3. Spearman correlation analysis of scale scores

	I	II	III	IV	V	VI	VII	VIII	IX
YIAT-SF (I)	1								
DASS-21 Total (II)	0.444**	1							
DASS-21 Depression (III)	0.382**	0.875**	1						
DASS-21 Anxiety (IV)	0.406**	0.816**	0.547**	1					
DASS-21 Stress (V)	0.353**	0.871**	0.643**	0.662**	1				
CBPAQ Total (VI)	-0.214**	-0.265**	-0.290**	-0.191**	-0.220**	1			
CBPAQ - Outcome Expectations (VII)	-0.099	-0.161*	-0.170**	-0.145*	-0.126	0.631**	1		
CBPAQ - Self-regulation (VIII)	-0.106	-0.195**	-0.236**	-0.099	-0.177**	0.867**	0.395**	1	
CBPAQ - Personal Barriers (IX)	0.309**	0.282**	0.260**	0.249**	0.241**	-0.729**	-0.218**	-0.495**	1
IPAQ Total physical activity (MET-minute/week) (X)	-0.131*	-0.07	-0.061	-0.081	-0.06	0.398**	0.204**	0.395**	-0.339**

*: Correlation is significant at the 0.05 level (two-tailed); **: Correlation is significant at the 0.01 level (two-tailed); YIAT-SF: Young Internet Addiction Test - Short Form; DASS-21: Depression-Anxiety-Stress Scale; CBPAQ: Cognitive Behavioral Physical Activity Questionnaire; IPAQ: International Physical Activity Questionnaire-Short Form.

Table 4. Univariate binary logistic regression analyses of the psychical activity predictors

Dependent variable	Predictor variable	B	p	Exp (B)	95% CI per Exp (B)	
					Lower	Upper
IPAQ \geq 3000 MET-min	YIAT-SF	-0.026	0.306	0.975	0.928	1.024
IPAQ \geq 3000 MET-min	CBPAQ - Outcome Expectations	1.226	0.001*	3.406	1.684	6.891
IPAQ \geq 3000 MET-min	CBPAQ - Self-regulation	1.587	0.000*	4.887	2.770	8.620
IPAQ \geq 3000 MET-min	CBPAQ - Personal Barriers	-1.608	0.000*	0.200	0.114	0.353
IPAQ \geq 3000 MET-min	CBPAQ - Total	0.966	0.000*	2.627	1.893	3.647

CI: Confidence interval; IPAQ: International Physical Activity Questionnaire-Short Form; YIAT-SF: Young Internet Addiction Test - Short Form; CBPAQ: Cognitive Behavioral Physical Activity Questionnaire.

2021). Our results are coherent with the physical activity levels observed in other studies. Considering the beneficial effects of physical activity on health, it can be concluded that university students are not sufficiently active.

Universities should encourage physical activity and provide necessary facilities. In our study, the relationship of dependent variables with each other was examined, and it was found that stress, anxiety, depression, and physical activity levels were not related. Former studies on the relationship between psychological stress and physical activity have reported that negative emotions such as stress and depression significantly decrease the level of physical activity and increase the level of physical inactivity (Yoon et al, 2023; Dougall et al, 2011; Elmas et al, 2021). Another study by Şahin on university students in 2022 stated that there was a significant differentiation in the psychological stress levels of students depending on the level

of physical activity (Sahin, 2022). The fact that our study is a cross-sectional study and the participants are students at a medical school with a relatively heavy academic workload may not have been sufficient to show the relationship between physical activity and psychological stress.

The results of this study should be interpreted together with limitations. The study's participants are medical students of a university ranked 12th in Türkiye (Eskişehir Osmangazi University, 2022). Therefore, our sample may be insufficient in representing university students in Türkiye. The study did not collect data on the participant's body mass index, medical and psychiatric history, alcohol, or any other drug use that would benefit while interpreting the results. Another limitation is the cross-sectional nature of our study. There is limited research evaluating cross-sectional data to show the cause-and-effect relationship.

The strengths of our study include evaluating the relationship between physical activity and psychological stress, internet addiction, and attitudes toward physical activity with valid and reliable measurement tools in a sufficient sample size.

Universities can apply several methods to encourage students to engage in physical activities, such as allocating specific time for health-promoting activities, credit-bearing physical activity units, and health education on physical activity (Schmidt et al, 2013; Taylor et al, 2022). This study's implementation might involve developing a cognitive behavioral therapy-based intervention for medical students to increase their physical activity.

In conclusion, the strongest predictor of the physical activity level in medical students is attitudes toward physical activity, according to this study's results. Changing the mindset of the medical students about physical activity with cognitive behavioral therapy-based interventions may reduce their sedentary behavior.

Ethics Committee Approval: The Eskişehir Osmangazi University Social and Human Sciences Research Ethics Committee granted approval for this study (date: 22.03.2023, number: 2023.04.09).

Author Contributions: Concept – İGYK; Design – İÖD, İGYK; Supervision – İGYK; Resource – İÖD, EÖ, İA; Materials – İÖD; Data Collection and/or Processing – İÖD, EÖ, İA; Analysis and/or Interpretation – İÖD, İGYK; Literature Search – İÖD, İGYK, EÖ, İA; Writing – İÖD, İGYK; Critical Reviews – İGYK.

Conflict of Interest: The authors have no conflict of interest to declare.

Use of AI for Writing Assistance: Not declared.

Financial Disclosure: The authors declared that this study has received no financial support.

Peer-review: Externally peer-reviewed.

REFERENCES

- Aljuwaiser, S., Brazzelli, M., Arain, I., & Poobalan, A. (2023). Common mental health problems in medical students and junior doctors - an overview of systematic reviews. *J Ment Health*, 1–37. doi: 10.1080/09638237.2023.2278095
- Aslan, I., Ochnik, D., & Çınar, O. (2020). Exploring perceived stress among students in Turkey during the COVID-19 pandemic. *Intl J Environ Res Public Health*, 17(23), 8961. doi: 10.3390/ijerph17238961
- Aydın, N. S., & Keklicek, H. (2020). The relationship between physical activity level and physical activity awareness among university students. *J Occup Ther Rehabil*, 8(2), 123–130. doi: 10.30720/ered.619945
- Ayhan, C., Işık, Ö., & Kaçay, Z. (2021). The relationship between physical activity attitude and life satisfaction: A sample of university students in Turkey. *Work*, 69(3), 807–813. doi: 10.3233/WOR-213513
- Baykal, T., & Soyupek, F. (2022). Physical activity levels of medical students: A global issue to be addressed. *J Contemp Med*, 12(6), 937–943. doi: 10.16899/jcm.1190953
- Booth, M. (2000). Assessment of physical activity: An international perspective. *Res Q Exerc Sport*, 71(Suppl 2), 114–120. doi: 10.1080/02701367.2000.11082794
- Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J. P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., Lambert, E., ... & Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med*, 54(24), 1451–1462. doi: 10.1136/bjsports-2020-102955
- Chou, C., Condrón, L., & Belland, J. C. (2005). A review of the research on Internet addiction. *Educ Psychol Rev*, 17(4), 363–388. doi: 10.1007/s10648-005-8138-1
- Craig, C.L., Marshall, A.L., Sjöström, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J.F., & Oja, P. (2003). International Physical Activity Questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*, 35(8), 1381–139. doi: 10.1249/01.MSS.0000078924.61453.FB
- Dąbrowska-Galas, M., Ptaszkowski, K., & Dąbrowska, J. (2021). Physical activity level, insomnia and related impact in medical students in Poland. *Int J Environ Res Public Health*, 18(6), 3081. doi: 10.3390/ijerph18063081
- Deniz, M. A., Çiftçi, R., Arpacı, M. F., & Şencan, D. (2024). The relationship of university students' internet addiction level through telephone use and 2d: 4d ratio. *Med Rec*, 6(2), 224–229. doi: 10.3233/WOR-230015
- Dougall, A. L., Swanson, J. N., Grimm, J. R., Jenney, C. T., & Frame, M. C. (2011). Tempering the decline in college student physical activity using informational interventions: Moderating effects of stress and stage of change. *J Appl Biobehav Res*, 16(1), 16–41. doi: 10.1111/J.1751-9861.2011.00064.X
- Elmas, L., Yüceant, M., Ünlü, H., Bahadır, Z. (2021). Investigation of the relationship between physical activity levels and psychological well-being of university students. *Sportive*, 4(1), 1–17.
- Eskiler, E., Küçükbiş, F., Gülle, M., & Soyer, F. (2016). The Cognitive Behavioral Physical Activity Questionnaire: A study of validity and reliability. *J Hum Sci*, 13(2), 2577–2587. doi: 10.14687/jhs.v13i2.3806
- Eskişehir Osmangazi University. (2022). ESOĞÜ, RUR Üniversite Sıralamalarında 12. Sırada. Available at: <https://ogu.edu.tr/>

- web/HaberDetay/1443
- Ilić, M., Pang, H., Vlaški, T., Grujičić, M., & Novaković, B. (2022). Motives and barriers for regular physical activity among medical students from the western Balkans (South-East Europe Region). *Int J Environ Res Public Health*, 19(23), 16240. doi: 10.3390/ijerph192316240
- IPAQ Research Committee. (2005). *Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)-short and long forms*. Available at: <https://www.ipaq.ki.se/scoring>
- Janampa-Apaza, A., Pérez-Mori, T., Benites, L., Meza, K., Santos-Paucar, J., Gaby-Pérez, R., Francia-Romero, I., & Morales, J. (2021). Physical activity and sedentary behavior in medical students at a Peruvian public university. *Medwave*, 21(5), e8210. doi: 10.5867/medwave.2021.05.8210
- Jenaro, C., Flores, N., Gómez-Vela, M., González-Gil, F., & Caballo, C. (2007). Problematic internet and cell-phone use: Psychological, behavioral, and health correlates. *Addict Res Theory*, 15(3), 309–320. doi: 10.1080/16066350701350247
- Khan, M. A., Shabbir, F., & Rajput, T. A. (2017). Effect of gender and physical activity on internet addiction in medical students. *Pak J Med Sci*, 33(1), 191–194. doi: 10.12669/pjms.331.11222
- Kim, S. E., Kim, J. W., & Jee, Y. S. (2015). Relationship between smartphone addiction and physical activity in Chinese international students in Korea. *J Behav Addict*, 4(3), 200–205. doi: 10.1556/2006.4.2015.028
- Ko, C. H., Yen, J. Y., Chen, C. S., Yeh, Y. C., & Yen, C. F. (2009). Predictive values of psychiatric symptoms for internet addiction in adolescents: A 2-year prospective study. *Arch Pediatr Adolesc Med*, 163(10), 937–943. doi: 10.1001/archpediatrics.2009.159
- Kutlu, M., Savcı, M., Demir, Y., & Aysan, F. (2016). Turkish adaptation of the Young Internet Addiction Test Short Form: Validity and reliability study on university students and adolescents. *Anatol J Psychiatry*, 17(Suppl 1), 69–76. doi: 10.5455/apd.190501
- Lovibond, P. F., & Lovibond, S. H. (1995a). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav Res Ther*, 33(3), 335–343.
- Lovibond, S. H., & Lovibond, P. F. (1995b). *Manual for the depression anxiety stress scales*. (2nd ed.). *Psychology Foundation of Australia*.
- Lu, X., Watanabe, J., Liu, Q., Uji, M., Shono, M., & Kitamura, T. (2011). Internet and mobile phone text-messaging dependency: Factor structure and correlation with dysphoric mood among Japanese adults. *Comput Hum Behav*, 27(5), 1702–1709. doi: 10.1016/j.chb.2011.02.009
- Moska, C., Goudriaan, A. E., Blanken, P., & Hendriks, V. (2023). Accuracy of the Depression, Anxiety and Stress Scale (DASS-21) for screening on comorbid internalizing disorders among youth in substance use disorder treatment. *Eur Addict Res*, 29(6), 385–393. doi: 10.1159/000533726
- Noroozi, F., Hassanipour, S., Eftekharian, F., Eisapareh, K., & Kaveh, M. H. (2021). Internet addiction effect on quality of life: A systematic review and meta-analysis. *Sci World J*, 2021, 2556679. doi: 10.1155/2021/2556679
- Özdöl Pinar, Y., Özdoğan, E. Ç., & Özer, K. (2018). Physical activity level in different occupational group. *Eurasian Res Sport Sci*, 3(1), 44–56. doi: 10.22396/ERISS.2018.35
- Pawlikowski, M., Altstätter-Gleich, C., & Brand, M. (2013). Validation and psychometric properties of a short version of Young's Internet Addiction Test. *Comput Hum Behav*, 29(3), 1212–1223. doi: 10.1016/j.chb.2012.10.014
- Sağlam, M., Arıkan, H., Savcı, S., İnal-İnce, D., Bosnak-Güçlü, M., Karabulut, E., & Tokgözoğlu, L. (2010). International physical activity questionnaire: Reliability and validity of the Turkish version. *Percept Mot Skills*, 111(1), 278–284. doi: 10.2466/06.08.PMS.111.4.278-284
- Sahin, M. (2022). Examination of physical activity and emotional status of university students. *Int J Sport Exerc Train Sci*, 8(2), 45–55. doi: 10.18826/useeabd.1093887
- Sarıçam, H. (2018). The psychometric properties of Turkish version of Depression Anxiety Stress Scale-21 (DASS-21) in health control and clinical samples. *J Cogn Behav Psychother Res*, 7(1), 19–30. doi: 10.5455/JCBPR.274847
- Schembre, S. M., Durand, C. P., Blissmer, B. J., & Greene, G. W. (2015). Development and validation of the Cognitive Behavioral Physical Activity Questionnaire. *Am J Health Promot*, 30(1), 58–65. doi: 10.4278/ajhp.131021-QUAN-539
- Schmidt, S., Rice, A., & Kolasa, K. (2013). Teaching by example: Educating medical students through a weight management experience. *Fam Med*, 45(8), 572–575.
- Sriramatr, S., Silalertdeskul, S., & Wachirathanin, P. (2016). Social cognitive theory associated with physical activity in undergraduate students: A cross-sectional study. *Pac Rim Int J Nurs Res*, 20(2), 95–105.
- Stratakis, K., Terzić-Šupičić, Z., Todorović, J., Nešić, D., & Novaković, I. (2024). Physical activity and mental health of medical students. *Cent Eur J Public Health*, 32(1), 39–44. doi: 10.21101/cejph.a8097
- Taylor, C. E., Scott, E. J., & Owen, K. (2022). Physical activity, burnout and quality of life in medical students: A systematic review. *Clin Teach*, 19(6), e13525. doi: 10.1111/

- tct.13525
- Tran, B. X., Mai, H. T., Nguyen, L. H., Nguyen, C. T., Latkin, C. A., Zhang, M. W. B., & Ho, R. C. M. (2017). Vietnamese validation of the short version of Internet Addiction Test. *Addict Behav Rep*, 6, 45–50. doi: 10.1016/j.abrep.2017.07.001
- Wang, Y., & Hollett, N. (2021). Cognitive, affective, and global attitude toward physical activity with different intensities. *Int J Sport Exerc Psychol*, 20(2), 551–568. doi: 10.1080/1612197x.2020.1869803
- World Health Organization. (2010). *Global recommendations on physical activity for health*. Available at: <https://www.who.int/publications/i/item/9789241599979>
- World Health Organization. (2022). *Global status report on physical activity 2022: Country profiles*. Available at: <https://www.who.int/publications/i/item/9789240059153>
- Yoon, E. S., So, W. Y., & Jang, S. (2023). Association between perceived psychological stress and exercise behaviors: A cross-sectional study using the Survey of National Physical Fitness. *Life (Basel)*, 13(10), 2059. doi: 10.3390/life13102059
- Young, K. S. (1998). *Caught in the net: How to recognize the signs of internet addiction and a winning strategy for recovery*. Wiley.
- Yüksel, Y., Aydoğmuş, M., Kayışoğlu, N., & Revan, S. (2021). Determination of physical activity levels of Karabuk University students. *Turk J Sport Exerc*, 23(2), 253–258. doi: 10.15314/tsed.925410
- Zhou, M., Zhu, W., Sun, X., & Huang, L. (2022). Internet addiction and child physical and mental health: Evidence from panel dataset in China. *J Affect Disord*, 309, 52–62. doi: 10.1016/j.jad.2022.04.115