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INVESTIGATION OF PHYSICAL ACTIVITY LEVELS AND DETERMINANTS IN MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: *The aim of this study was to assess the levels of physical activity in medical faculty students and identify factors associated with their physical activity levels.*

Material and Method: *This cross-sectional study was conducted among 171 medical students in the Cerrahpaşa Faculty of Medicine between November 2022 and February 2023. The questionnaires were administered via an online form. The questionnaire consisted of a global physical activity questionnaire and questions about personal characteristics such as sex, weight and height.*

Result: *The prevalence of a sedentary lifestyle was 12.9%. A significant difference in weekly metabolic equivalent of task (MET) scores was found between the sexes (p=0.02), with males being more active than females. Travel was the most prevalent subdomain among medical students. There was a significant difference between sex groups in the vigorous recreation subdomain (p<0.001), with males being more active. There was no statistically significant difference between the grades in terms of weekly MET scores. A significant correlation was found between body mass index and the vigorous recreation subdomain. (r=0.184, p=0.016).*

Conclusion: *The prevalence of a sedentary lifestyle was 12.9%, and males had significantly greater MET scores than females. In addition, males were found to have higher MET scores for vigorous recreation than females. Besides, the physical activity attitudes of physicians influence the effectiveness of lifestyle recommendations to patients. In this respect, this study will provide valuable information for improving the general health and well-being of medical students, promoting physical activity and eliminating differences between sex groups.*

Keywords: *Exercise, medical students, physical activity, sedentary lifestyle,Türkiye.*

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TIP FAKÜLTESİ ÖĞRENCİLERİNDE FİZİKSEL AKTİVİTE DÜZEYLERİ VE BELİRLEYİCİLERİNİN ARAŞTIRILMASI: KESİTSEL BİR ÇALIŞMA

ÖZET

Amaç: Bu çalışmanın amacı, Türk tıp öğrencilerinin fiziksel aktivite düzeylerini değerlendirmek ve fiziksel aktivite düzeyleri ile ilişkili faktörleri belirlemektir.

Materyal ve Metot: Bu kesitsel çalışma, Kasım 2022 ile Şubat 2023 tarihleri arasında Cerrahpaşa Tıp Fakültesi'ndeki 171 tıp fakültesi öğrencisi üzerinde yürütülmüştür. Global Fiziksel Aktivite Anketi ve cinsiyet, kilo ve boy gibi kişisel özelliklerle ilgili sorulardan oluşan anket çevrimiçi form aracılığıyla uygulanmıştır.

Bulgular: Sedanter yaşam tarzı prevalansı %12,9 olarak bulunmuştur. Haftalık Metabolik Eşdeğer Dakika (MET) skorlarında cinsiyetler arasında anlamlı bir fark bulunmuş (p=0,02), erkeklerin kadınlardan daha aktif olduğu görülmüştür. Tıp öğrencileri arasında en yaygın aktivite alt grubu ulaşım aktivitesiydi. Ağır boş zaman aktivitesi alt grubunda cinsiyet grupları arasında anlamlı bir fark vardı (p<0,001) ve erkekler daha aktifti. Haftalık MET skorları açısından sınıflar arasında istatistiksel olarak anlamlı bir fark bulunmamıştır. Vücut kitle indeksi ile boş zamanlardaki ağır aktivite arasında anlamlı bir korelasyon bulunmuştur. (r=0,184, p=0,016).

Sonuç: Sedanter yaşam prevalansı %12,9 bulunurken, erkeklerin kadınlara göre MET skorları anlamlı düzeyde yüksek bulundu. Ek olarak, erkeklerde kadınlara göre boş zamandaki fiziksel aktivite açısından daha yüksek MET skoruna sahip olduğu bulundu. Ayrıca hekimlerin fiziksel aktivite tutumları, hastalara uygulanan yaşam tarzı önerilerinin etkinliğini etkilemektedir. Bu bakımdan, tıp öğrencilerinin genel sağlık ve refahını iyileştirmek, fiziksel aktiviteyi teşvik etmek ve cinsiyet grupları arasındaki farklılığı gidermek için bu çalışma değerli bilgiler sağlayacaktır.

Hastalara yapılacak yaşam tarzı önerilerinin etkinliği de hekimlerin fiziksel aktivite tutumlarından doğrudan etkilendiği için önem taşımaktadır. Bu çalışma, fiziksel aktiviteyi teşvik etmek, cinsiyet grupları arasındaki farklılığı gidermek ve Türk tıp öğrencilerinin genel sağlık ve refahını iyileştirmek için değerli bilgiler sağlayacaktır.

Anahtar kelimeler: Egzersiz, tıp öğrencileri, fiziksel aktivite, sedanter yaşam tarzı, Türkiye.

INTRODUCTION

Physical activity is defined as any voluntary body movement that requires energy expenditure generated by skeletal muscles. The World Health Organization (WHO) provides recommendations for physical activity to various age groups. For adults aged 18-65, the recommendation is to engage in at least 150-300 minutes of moderate-intensity aerobic physical activity per week. Adults who do not perform at least 150 minutes of moderate-intensity aerobic exercise in a week are classified as having insufficient physical activity.[1]

Physical inactivity is a serious problem for public health globally, including Türkiye. It is the fourth leading risk factor for mortality, with an estimated 3.2 million deaths attributed to physical inactivity each year.[2] Despite the known benefits of physical activity, a sedentary lifestyle is becoming increasingly prevalent in Turkish society.[3] In particular, medical students may have a more sedentary lifestyle due to their high academic workload and stress levels.[4]

In addition to physical inactivity, a sedentary lifestyle is also a serious problem. A lack of physical activity can lead to a sedentary lifestyle. A sedentary lifestyle is defined as any waking behavior involving activities such as sitting with an energy expenditure of 1.5 metabolic equivalent tasks (METs) or less.[5] The prevalence of a sedentary lifestyle has been identified to be 27.5% worldwide according to a data analysis study.[6] According to the results of the Turkish Nutrition and Health Survey conducted by the Ministry of Health of the Republic of Turkey in 2017, 27.7% of men and 51% of women between the ages of 18 and 29 had low levels of physical activity according to the recommendations of the Global Physical Activity Questionnaire (GPAQ).[7]

Examples of a sedentary lifestyle include watching television, playing computer games, and sitting at school or work, among others.[5] Numerous studies indicate that sedentary behavior negatively affects an individual's health, leading to increased all-cause mortality, cardiovascular disease mortality, and cancer mortality, among other effects.[8,9]

As future healthcare professionals, medical students are expected to demonstrate healthy behavioral patterns and encourage physical activity among their patients.[10] However, previous research has shown that medical students in Türkiye have lower levels of physical activity than other university students and the general population.[11] A pilot study conducted at Gazi University in 2020 revealed that 61.2% of

students had a sedentary lifestyle.[12] Furthermore, a study involving 256 medical students revealed that 47 students had low levels of physical activity. The study also mentioned that sex did not significantly influence physical activity levels.[13] These findings raise concerns about the potential negative effects on the health and well-being of medical students, as well as their ability to effectively promote healthy lifestyles to their patients.

Indeed, there has been limited research on physical activity among medical students in Türkiye. Most of the studies conducted on physical activity have been carried out in high-income countries, where cultural and social norms related to medical education and physical activity may differ.[14] Moreover, there is limited information available regarding the factors that influence the levels of physical activity among medical students in Türkiye.

The purpose of this study was to evaluate the levels of physical activity among medical students, to compare male and female students, to examine how these levels change with academic year and to identify variables that are related to these levels of physical activity.

MATERIAL AND METHOD

Design

This cross-sectional study was conducted among medical students at the Cerrahpaşa Faculty of Medicine between November 2022 and February 2023. The inclusion criteria comprised studying at the Cerrahpaşa Faculty of Medicine during the study period, being willing to participate, and providing online informed consent. There were no exclusion criteria, ethnicity, etc. The questionnaires were administered online (Google Forms). During the analysis, participants who did not complete all data groups, had inconsistencies in the information provided, or claimed to have engaged in more than 16 hours of activity in any specific subtype were excluded from the analysis due to recommendation of the Global Physical Activity Questionnaire (GPAQ) Guide (ATIF: WHO. GPAQ Analysis Guide. https://www.who.int/docs/default-source/ncds/ncd-surveillance/gpaq-analysis-guide.pdf Accessed: April 26, 2024). As a result, the data of four participants were deemed invalid. Thus, the study included 171 participants with complete data.

Ethics

This study was approved by the Ethics Committee of Istanbul University-Cerrahpasa (04.10.2022-499693). Online informed consent was obtained from all participants. When the survey link was clicked, a page was opened that introduced the study and included an informed consent form. The participants who clicked on the "I agree to participate in the research" button reached the page containing the questionnaire and scale. The study was conducted in accordance with the Declaration of Helsinki.

Sample Size and Sampling

The sample size was calculated using OpenEpi. The following parameters were used for sample size calculation: total number of students at the faculty, 2580; 95% confidence interval; design effect, 1.2; expected prevalence, 20%; and precision of the estimate, 5%. A sample size of 122 was calculated.

Measures

The questionnaire consisted of two sections. In the first section, there were questions about personal characteristics such as sex, weight and height. A global physical activity questionnaire was used in the second section.

Personal Characteristics

The demographic variables were sex and academic year. Body mass index (BMI) was calculated using self-reported weight and height (kg/m^2).

Global Physical Activity Questionnaire

The WHO developed the Global Physical Activity Questionnaire to track national physical activity levels. It includes 16 questions (P1-P16) and gathers data on sedentary behavior as well as engagement in physical activity in subdomains: vigorous work, moderate work, travel, vigorous recreation, and moderate recreation.[15]

Data from the Global Physical Activity Questionnaire (GPAQ) were analyzed using the metabolic equivalent of task (MET) value. The intensity of physical activity is frequently expressed in terms of metabolic equivalents (METs). A person's working metabolic rate is measured in relation to their resting metabolic rate, or MET. One MET is defined as the energy cost of sitting quietly and is equivalent to a caloric consumption of 1 kcal/kg/hour. The following existing guidelines have been applied for the analysis of GPAQ data: being moderately active is thought to increase a person's caloric consumption by four times, and being actively active is thought to increase it by eight times compared to simply sitting still.[15]

Table 1. Demographic characteristics of participants in the study (n=171)

Academic Year	n	Height(cm) Mean±SD	Weight(kg) Mean±SD	BMI Mean±SD	Sex	
					Male n(%)	Female n(%)
1	54	174.34±9.90	67.98±15.44	22.16±3.49	32(%59.26)	22(%40.74)
2	21	173.76±8.09	67.38±9.80	22.25±2.36	15(%71.43)	6(%28.57)
3	29	173.17±8.45	70.45±15.33	23.27±3.59	18(%62.07)	11(%37.93)
4	17	174.18±10.23	67.94±13.64	22.20±2.90	11(%64.71)	6(%35.29)
5	32	175.28±8.01	70.13±10.89	22.70±2.19	22(%68.75)	10(%31.25)
6	18	171.50±8.06	65.50±11.50	22.11±2.20	9(%50)	9(%50)
Total	171	173.93±8.90	68.46±13.38	22.46±2.99	107(%62.57)	64(%37.43)

SD: Standard deviation, **BMI:** Body mass index

Table 2. The weekly metabolic equivalent of task (MET) scores by sex and age and in all groups.

Academic Year/MET	Sex/MET (Median (25^{th}-75^{th} percentile))		Total
	Male	Female	
1	2500(1030-3420)	1920(520-3960)	2320(840-3600)
2	4560(2880-6480)	1360(360-2440)	3540(1560-5160)
3	2220(1600-6240)	1380(900-2840)	2160(1000-4200)
4	1440(600-2880)	2280(400-2720)	1800(600-2720)
5	2580(1680-4340)	2040(720-4000)	2580(1270-4170)
6	3240(2460-3960)	2280(1080-3540)	2900(1260-3960)
Total	2560(1320-4560)	1990(750-3570)	2400(1120-4000)

Table 3. Comparison of weekly metabolic equivalent of task (MET) scores by sex and age

	MET Score	*p*
Sex	**Median (25^{th}-75^{th} percentile)**	
Male	2560(1320-4560)	0.023*
Female	1990(750-3570)	
Academic Year	**Median (25^{th}-75^{th} percentile)**	
1	2320(840-3600)	0.277¶
2	3540(1560-5160)	
3	2160(1000-4200)	
4	1800(600-2720)	
5	2580(1270-4170)	
6	2900(1260-3960)	

*: Mann-Whitney U test; ¶: Kruskal-Wallis test was applied.

The translation and validity-reliability study of the Global Physical Activity Questionnaire (GPAQ) in Turkish was conducted by Adıgüzel *et al.* in 2019. The test-retest reliability was substantial and near perfection. The kappa statistics ranged between 0.74 and 0.87, and the Spearman correlation coefficient ranged between 0.77 and 0.91. The discriminant and criterion validity of the scale were reported. A substantial, near-perfect relationship was found between the International Physical Activity Questionnaire (IPAQ) and GPAQ (r=0.79-0.94).[16]

According to the analysis guide of the Global Physical Activity Questionnaire (GPAQ) published by the World Health Organization (WHO), the duration of physical activity in various domains, such as vigorous work, moderate work, travel, vigorous recreation, and moderate recreation, as well as their total, were calculated as weekly MET scores. Participants were then divided into two categories for physical activity based on MET scores: sedentary lifestyle (<600 MET minutes/week) and nonsedentary (≥600 MET minutes/week) (ATIF: WHO. Global Physical Activity Questionnaire (GPAQ) Analysis Guide. https://www.who.int/docs/default-source/ncds/ncd-surveillance/gpaq-analysis-guide.pdf Accessed: April 26, 2024)

Statistical Analyses

The Statistical Package for the Social Sciences version 21.0 for Windows (IBM Corp., Armonk, NY, USA) was used for data evaluation and analysis. Categorical variables are presented as frequencies (n) and percentages (%), and numeric variables are presented as the mean ± standard deviation or median (25^{th} percentile-75^{th} percentile). The Kolmogorov-Smirnov test, histograms, skewness, and kurtosis values were used to evaluate normality. The Mann-Whitney U test was used to compare continuous variables between two independent samples. The Kruskal-Wallis test was used to compare continuous variables between three or more independent samples. Spearman's rank correlation coefficient was used to assess the strength and direction of the association between two variables. The significance level of the statistical tests was set at $p<0.05$.

RESULTS

A total of 171 individuals participated in the study, 62% (n=107) of the participants were male, and the mean BMI was 22.45±2.98. The participants' sex, academic year and BMI characteristics are shown in Table 1.

The MET scores, grouped according to participants' sex and academic year categories, are shown in Table 2. The median weekly MET score was 2400 (1120-4000) (2560 (1320-4560) in males; 1990 (750-3570) in females).

The test results assessing whether there were differences in weekly MET scores among the groups formed by sex and academic year are presented in Table 3. There was a statistically significant difference in the MET score between the sexes ($p=0.023$). The median weekly MET was significantly greater in males than in females. There was no statistically significant difference between the grades ($p=0.277$).

Table 4. Comparison of weekly metabolic equivalent of task (MET) and subscores by sex and grade

	Vigorous work	*p*	Moderate work	*p*	Travel	*p*	Vigorous recreation	*p*	Moderate recreation	*p*
Sex										
Male	0(0-0)		0(0-120)		270(140-420)		90(0-240)		15(0-150)	
Female	0(0-0)	0.284*	0(0-120)	0.510*	180(90-420)	0.257*	0(0-105)	<0.001*	30(0-105)	0.858*
Academic Year										
1	0(0-0)		0(0-75)		210(90-420)		0(0-150)		42(0-200)	
2	0(0-0)		90(0-300)		240(120-315)		180(0-360)		60(30-240)	
3	0(0-0)	0.959¶	0(0-45)	0.290¶	250(150-420)	0.060¶	0(0-180)	0.449¶	30(0-60)	0.086¶
4	0(0-0)		0(0-60)		150(60-150)		0(0-180)		0(0-60)	
5	0(0-0)		10(0-120)		390(160-420)		30(0-225)		0(0-60)	
6	0(0-0)		0(0-75)		270(120-315)		85(0-270)		5(0-240)	

*: Mann-Whitney U test; ¶: Kruskal-Wallis test was applied.

The results of the tests conducted for the analysis of the MET score subdomains are shown in Table 4. The analysis of vigorous recreation among sex groups revealed a statistically significant difference between the two groups ($p < 0.001$), indicating that males were more active than females were.

No significant difference was found among the subdomain scores among the academic year categories.

The test results examining the relationship between body mass index (BMI) and the MET score are presented in Table 5. Spearman correlation analysis was conducted to examine the relationships between body mass index (BMI) and activity subgroups, and a significant correlation was found between BMI and vigorous recreation (r=0.184; p=0.016).

In addition, 12.9% (n=22) of the participants were classified as having a sedentary lifestyle according to the definition of the World Health Organization.

DISCUSSION

In this cross-sectional study, the physical activity levels of medical students were evaluated, and factors associated with physical activity levels were investigated.

In this study, the weekly MET score of males was greater than that of females. This finding indicates that the sex-based difference in physical activity observed in the general population is also reflected among medical students. Trost *et al.* supported this view by demonstrating that males exhibit higher levels of physical activity in primary and high school students.[17]

In our study, no significant relationships were found between academic year and general physical activity or between academic year and physical activity. This result suggests that despite the differences between classes, individuals' activity variables in their own lifestyles do not vary significantly. Üçok *et al.* reported that there was no significant difference between classes in terms of activity levels in their study of medical faculty students.[13] These findings may indicate that factors such as workload, practical-theoretical class ratio, being an intern, or preparing for residency exams are not significant determinants of physical activity among medical faculty students.

In our study, males were more active than females in terms of vigorous recreation. Similarly, in a study conducted in China, 44.1% of males reported moderate occupational activity, while 55.5% of females reported light occupational activity.[18,19]

According to an analysis conducted in 2014 based on six community-based prospective cohort studies between 1992 and 2003, there is a threshold of benefit when 3 to 5 times the minimum level of physical activity recommended in the 2008 Physical Activity Guidelines for Americans is reached.[20] No increased risk was observed beyond reaching 10 or more times

Table 5. The relationship between Body mass index (BMI) subgroups and weekly metabolic equivalent of task (MET) score

Subgroups	BMI	
	Correlation coefficient	*p*
Vigorous Work	$r_s = 0.072$	0.350
Moderate Work	$r_s = 0.069$	0.371
Travel	$r_s = -0.023$	0.761
Vigorous Recreation	$r_s = 0.184$	0.016
Moderate Recreation	$r_s = 0.120$	0.118
Total Weekly MET	$r_s = 0.047$	0.542

BMI: Body mass index
Spearman Correlation Analysis was applied.

the minimum level.[21] The increase in health benefits even when the activity level reaches 3-5 times the recommended limits indicates the importance of investigating the reasons for the lower leisure-time activity levels in females than in males.

Paudel *et al.* determined that barriers to leisure-time physical activity, such as family and household responsibilities, lack of support and fear of being judged, constituted interpersonal barriers, while environmental barriers included lack of a supportive social norm, lack of open space, weather conditions and perceived safety concerns.[22] A study conducted in Qatar revealed that students' physical activity levels were affected by sex, family and culture.[14] Furthermore, the same study identified prioritizing physical activity, social support, encouraging group-based activities, and age-appropriate public exercise facilities as important facilitators of physical activity. According to a study published by Reicher *et al.* in 2007, significant reasons for insufficient leisure-time activity include a lack of money (40.3%) and feeling too tired (38.1%).[23] Based on this information and the data provided by our study, to address the sex disparity in the vigorous recreation subdomain, it is necessary to provide group-based activities and construct age-appropriate public exercise facilities. This would ensure more equal access to sports facilities for different segments of society. Decision makers should implement these risk-reducing public health policies.

When examining body mass index (BMI) with all activity subgroups, it was found that only vigorous recreation had a significant relationship with BMI (p value=0.002, Spearman correlation coefficient=0.219). These findings indicate that individuals who engage in sports during their leisure time are more likely to be overweight. However, due to the cross-sectional nature of our study, it is insufficient to explain the causality of whether weight gain leads to engaging in sports or if engaging in sports leads to weight gain. However, other studies in the literature show the opposite relationship. Peterson *et al.* found an inverse relationship between moderate-intensity activity and BMI in their study on college students. Godin *et al.* also reported a significant inverse relationship between BMI and vigorous recreation in a study involving 1,530 individuals.[24,25] The analysis revealed that travel subdomain had the greatest contribution to the physical activity profile of medical school students. The density of traffic in Istanbul, the city where the study was conducted, and the use of public transportation (transfers, etc.) could be the reasons behind this result. However, there is insufficient local literature to reach a conclusive understanding of this issue. According to the demographic results of our study, the mean body mass index (BMI) of medical school students was 22.45±2.98. Of the 171 participants, 14 individuals (8%) had a BMI below 18.5, 125 individuals (73%) had a BMI between 18.5 and 24.9, 29 individuals (17%) had a BMI between 25.0 and 29.9, and 3 individuals (2%) had a BMI of 30 or higher. Among the participants, 29 individuals (17.0%) had a BMI in the range of 25.0 to<30, which falls into the overweight category. Three individuals (1.8%) had a BMI of 30.0 kg/m^2 or higher, indicating obesity. In a study conducted by Huang *et al.* using direct measurement of BMI, they found a prevalence rate of 21.6% for overweight and 4.9% for obesity. These values reflect the distribution of BMI among our medical students, and we obtained similar results.[26] In a study conducted among medical students in Nepal, 39 out of 266 students (15%) were identified as overweight.[27] In a cross-sectional population-based study conducted in Türkiye by Hatemi *et al.* with 20,119 participants in 11 different cities, the prevalence rate of overweight was 25.0%, and the prevalence rate of obesity was 19.4%. Among females, 24.3% were overweight, 24.6% were obese, 25.9% were overweight, and 14.4% were obese. The mean BMI of the studied population was 27.59±4.61 kg/m^2.[28] Comparing the results of this study conducted on the Turkish population with our findings, it can be observed that the mean BMI and prevalence of obesity among medical school students follow healthier patterns compared to those of the general population. These results indicate that the demographic findings of our study on medical school students align with similar studies in the international literature. According to the definition of the World Health Organization, 22 (12.9%) of the 171 students who were examined were sedentary. These data are important for predicting potential harm caused by a sedentary lifestyle among medical students. According to a study examining the impact of physical activity, nutrition and lifestyle factors on the academic success of medical students, a significant relationship was found between high physical activity habits and high grade point averages.[29]

In the study conducted by Gathman *et al.*, the physical activities of undergraduate students were compared, and it was found that students in health-related majors had higher physical activity scores than did students in health-unrelated majors, except for students in kinesiology and physical education majors (p=0.009).[30] This finding indicates that medical students are more active than the general population. These results may be associated with medical students having more knowledge about the harms of a sedentary lifestyle compared to the general population.

Strengths and Limitations

When examining the literature, the physical activity of university students has been significantly neglected as a research area. In this regard, this study is a pioneering study that examines this problem among university students in Türkiye. This study provides valuable information for promoting physical activity and improving the overall health and well-being of medical students. By identifying the factors that influence physical activity levels among medical students, this research can contribute to the development of interventions and policies that promote physical activity, thereby helping to enhance the health and well-being of both medical students and their future patients.

However, this study has several limitations. First, our study was conducted in one medical faculty; therefore, the findings cannot be generalized to all medical students. Second, the study was conducted as an online survey. Conducting the study as an online survey may introduce biases or limitations in data collection methods, such as self-reports, which can be influenced by selective recall or social desirability. The third factor is inequality in participation between classes: unequal participation across different classes or groups can introduce bias in the sample and affect the generalizability of the findings. Finally, this was a cross-sectional study, which limits the ability to establish cause-and-effect relationships. Cross-sectional studies provide a snapshot at a specific point in time and cannot determine causality. These factors should be taken into consideration when interpreting the results and generalizing them to the broader population.

CONCLUSION

In this study, the median MET scores of medical school students was 2400 (1120-4000). An equivalent combination of moderate- and vigorous-intensity physical activity resulting in at least 600 MET minutes is considered a sedentary lifestyle. Therefore, the prevalence of a sedentary lifestyle was 12.9%. The MET scores were significantly greater in males than in females. No significant differences were found in any physical activity subgroup when comparisons were made between grades.

The physical activity levels of medical school students and their knowledge of the benefits of physical activity are important because they directly influence the reliability of lifestyle change recommendations given to patients and can impact the potential change in the quality of patient care. Advice from doctors who are not physically active themselves may not be effective. It is expected that medical students, who become active healthcare providers upon graduation, exhibit healthy behavior patterns and promote physical activity to their patients.

Based on the findings of this study, measures that can be taken to increase the physical activity of medical school students may include establishing sports facilities and physical activity areas on medical school campuses that can be utilized by students regardless of sex. This can help eliminate sex differences in both overall physical activity and vigorous physical activity during leisure time.

Author Contributions

Conceptualization, MAG, ÖA and HB; methodology, MAG, ÖA, BA and US; formal analysis, MAG and HB; data curation, MAG, ÖA and BA; writing-original draft preparation, MAG, ÖA and HB; writing-review and editing, MAG, BA and US; supervision, US. All authors have read and agreed to the published version of the manuscript.

*The authors declare that there are no conflicts of interest.

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