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GENDER AND PHYSICAL ACTIVITY AMONG UNIVERSITY STUDENTS FROM THE VISEGRAD GROUP COUNTRIES: A CROSS-SECTIONAL STUDY

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Summary

Background. Physical activity is a direct determinant of human health, constituting a key component of a healthy lifestyle. The aim of the study was to determine differences in the level of physical activity between female and male university students from the Visegrad Group countries.

Material and methods. The study included 2,697 students from four Visegrad Group countries. Physical activity was assessed using the long version of the International Physical Activity Questionnaire (IPAQ-LF). Descriptive statistics, chi-square tests, and the Mann-Whitney U test were used to compare groups. Values of $p<0.05$ were considered statistically significant.

Results. The level of physical activity and the amount of time spent sitting, as reported by the students, showed significant associations with the country (university) of study. The highest level of total physical activity was observed among Polish students, with job-related activities contributing the most to overall physical activity. Statistically significant differences between genders were found in both vigorous and moderate physical activity, as well as in the domains of work and household activities.

Conclusions. The study results confirm that gender is a statistically significant variable differentiating the level of physical activity among university students from the Visegrad Group countries, with males being more active. Significant associations were demonstrated between vigorous and moderate physical activity, as well as specific domains of physical activity and gender.

Keywords: IPAQ-LF, Visegrad, physical activity, gender, students

Introduction

Contemporary health challenges have become a global issue. The conscious shaping of one's lifestyle can contribute to the improvement and maintenance of health and well-being,

regardless of age. In this context, regular physical activity (PA) is a key factor in preventing chronic non-communicable diseases and premature morbidity and mortality. PA is beneficial for an individual's health – "Some physical activity is better than doing none" [1]. The World Health Organization (WHO) recommends that adults undertake at least 150 minutes of moderate-intensity PA (MPA) or 75 minutes of vigorous-intensity PA per week, supplemented with muscle-strengthening activities twice a week [1-3]. Considering total PA (across various domains and intensities), the greatest health benefits are observed at levels exceeding 3000 metabolic equivalents of task (MET)-minutes per week [4].

It is estimated that 24% of young adults fail to meet these recommendations, highlighting an urgent need for action to promote an active lifestyle [5]. Meta-analysis results indicate that about 40% to 50% of university students [6] and 31% of all adults worldwide are insufficiently physically active [7]. The WHO has classified physical inactivity as the fourth leading risk factor for global mortality, which not only negatively impacts the individual but also poses a significant economic burden [8].

Moderate-to-vigorous PA (MVPA) plays a crucial role in the overall health and well-being of young adults [9], primarily due to its significant positive impact on the cardiovascular system [10], cognitive functions [11], and mental health, including stress reduction and improved sleep quality [12]. Engagement in MVPA not only helps maintain a healthy body weight and reduces the risk of chronic diseases but also enhances overall physical fitness and endurance [13].

Researchers point to gender differences in PA, which is higher among male students compared to females [14]. Study results also confirm that males exhibit higher levels of both moderate and vigorous PA [15]. Therefore, it is important to account for gender when analyzing PA levels [16]. Psychosocial factors, such as self-efficacy, social support, and motivation, are considered key determinants associated with PA, explaining differences between females and males [17]. Previous studies have demonstrated the positive effect of PA on cognitive functions and well-being, as well as gender-related differences in exercise motivation [18].

According to Bergier et al. [19], measuring the PA levels of university students, as future elites and promoters of a healthy lifestyle, should be a priority, as their attitudes towards activity, as a personal and social experience, can be emulated by others. Interventions promoting PA among students remain insufficient and yield only moderate effects. There is a lack of a multi-level approach (i.e. personal, environmental) to studying PA behaviors in the student population. Furthermore, PA measurement tools are often subjective and inconsistent,

making the comparison of PA patterns between distinct groups difficult or even impossible [20].

Aim of the work

The aim of the study was to determine the differences in the PA levels of female and male students from the Visegrad Group countries. Achieving this objective allows for a better understanding of the social and cultural determinants of PA among young adults, as well as capturing the specific nature of health behaviors resulting from different traditions and lifestyles in individual countries.

Material and methods

The study included a total of 2,697 students from four Visegrad Group countries. The participating institutions were University of Pécs (Hungary), John Paul II University in Biała Podlaska (Poland), Pavol Jozef Šafárik University in Košice (Slovakia), and the University of South Bohemia in České Budějovice (Czech Republic). The initial target sample size was set at a minimum of 300 respondents from each country. Each center was responsible for local recruitment, data collection, and ethical compliance (approval from respective Bioethics Commissions).

The collected data were characterized by gender, age, body composition parameters (Body Mass Index – BMI), country, field of study, self-rated health status and quality of life, and frequency of PA (weekly). The universal characteristics of the study population, including the variables listed above, are presented in Table 1.

Table 1. Universal characteristics of the study group

University students		N*	Mean /n	SD / %
Age			21.30	±2.34
Body Mass Index	**BMI kg/m^2**		23.15	4.22
	Underweight (<18.5)	2651	218	8.22
	Normal (18.5-24.9)		1758	66.31
	Overweight (25-29.9)		480	18.11
	Obese (>=30)		195	7.36
Gender	**Female**	2697	1945	72.12
	Male		752	27.88

Country	**Czech Republic**	2691	655	24.34
	Hungary		904	33.59
	Poland		498	18.51
	Slovakia		634	23.56
Type of studies	**Natural sciences**	2697	170	6.30
	Engineering		386	14.31
	Medical		232	8.60
	Humanities		447	16.57
	Health and sport		1007	37.34
	Other		455	16.87
Weekly sports participation			3.67	±1.72

Notes: * The number of respondents varies depending on the variable due to missing values (e.g. some participants did not provide complete answers regarding body weight, height, or country).

The study was conducted using the long version of the International Physical Activity Questionnaire (IPAQ-LF) – a validated self-report instrument that records MVPA across four domains (work, active transport, household, and leisure-time) and daily sitting time. The obtained responses were converted into minutes of MVPA per week using standard IPAQ scoring protocols [21,22].

The IPAQ questionnaire was supplemented with author-derived questions regarding body weight and height, allowing for the calculation of BMI.

Statistical analysis

The collected data were analyzed using IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA). Quantitative variables are presented using the mean ($\bar{x}$), median, standard deviation (SD), and positional measures, i.e. percentiles. The Chi-square test was used to analyze the relationship between two categorical variables. The Mann-Whitney U test was used to determine differences between two independent groups. Statistical significance was set at $p<0.05$.

Results

The results of the present study indicate that the levels of PA and sitting time reported by the respondents show significant associations with the country (university). The highest total PA level (median) was found among students from Poland, with job-related activities contributing the most to overall PA among the four domains. Considering total PA values, students from Hungary were the least active (median 1,370 min/week, 25-75 percentiles: 740.00-2,295.00), while the most active were Polish students from John Paul II University in Biała Podlaska (median 2,490 min/week, 25-75 percentiles: 1,180.00-4,170.00). The median daily PA was 1,780 min for students from the Czech Republic (25-75 percentiles: 960.00-3,060.00) and 2,000 min/day for students from Slovakia (25-75 percentiles: 1,110.00-3,262.50). In contrast, the declarations of students from the respective universities regarding sitting time on weekends were consistent, with a median of 300 min/day in all four cases (Table 2). The largest difference between the 75th and 25th percentiles of IQR (interquartile range) was recorded in the group of students from Poland and Hungary (300 min/day). Among respondents from the Czech Republic, the IQR value was 180 min/day, while among respondents from Slovakia, it was 240 min/day. Regarding self-reported sitting time on weekdays, the results varied. It was found that both Czech and Hungarian students spent an average of 6 hours per day on sedentary behaviors. Students from Slovakia spent one hour less in a sitting position during the working week. For the respondents from Poland, the average sitting time on a weekday was 322 minutes (25-75 percentiles: 195.68-200.00).

Furthermore, in our study, males exhibited statistically significantly higher values of overall PA compared to female students (Table 3). Male students participated in more vigorous activities than females, as evidenced by a more than two-fold higher median value for vigorous-intensity effort (500 min/week, 25–75 percentiles: 128.00-960.00 vs. 240 min/week, 25–75 percentiles: 60.00-540.00). Statistically significant (p<0.05) gender differences were observed in the high-intensity efforts, as well as in MPA. Considering the individual PA domains, statistically significant differentiation also occurred in the work and household domains.

In the group of female students, significantly higher values of sitting time during weekdays were recorded compared to those declared by males. The difference in the median was 60 minutes. During weekends, both female and male students spent an average of 300 min/day sitting (25-75 percentiles: 180.00-420.00 vs. 25-75 percentiles: 180.00-480.00).

Table 2. PA of the studied students by country (min/week)

PA area	Czech Republic (n=655)					Hungary (n=904)					Poland (n=498)					Slovakia (n=634)					Chi-square	*p*
	Mean	Median	SD	Percentiles		Mean	Median	SD	Percentiles		Mean	Median	SD	Percentiles		Mean	Median	SD	Percentiles			
				25th	75th				25th	75th				25th	75th				25th	75th		
Job-related activities	888.57	720.00	827.48	170.00	1390.00	603.32	397.50	680.49	30.00	930.00	1104.96	900.00	888.82	340.00	1650.00	969.37	810.00	719.65	420.00	1340.00	200.469	0.001*
Transportation	902.56	840.00	519.00	506.00	1255.00	741.92	630.00	461.08	400.00	1020.00	1051.52	952.50	668.92	510.00	1440.00	793.35	700.00	507.86	390.00	1089.25	90.592	0.001*
Active transportation	425.24	315.00	357.24	150.00	630.00	387.98	300.00	323.98	160.00	480.00	554.69	420.00	498.19	150.00	840.00	401.53	300.00	369.65	120.00	542.25	29.194	0.001*
Housework PA	428.50	220.00	573.36	60.00	570.00	305.63	155.00	402.24	43.50	420.00	686.91	360.00	861.46	120.00	960.00	479.37	267.50	580.73	90.00	690.00	112.272	0.001*
Recreational activities	470.40	360.00	457.91	131.00	690.00	414.46	300.00	416.06	120.00	570.00	558.69	360.00	629.39	120.00	782.50	496.59	345.00	505.59	120.00	720.00	7.832	0.05**
Weekly moderate activities	1757.25	1500.00	1278.59	750.00	2430.00	1363.57	1097.50	1077.84	570.00	1863.75	2336.79	1890.00	1809.33	955.50	3315.00	1828.12	1530.00	1338.68	810.00	2526.00	131.527	0.001*
Weekly vigorous activities	451.58	240.00	522.60	60.00	642.50	346.80	215.00	410.57	40.00	495.00	583.27	400.00	625.45	90.00	900.00	518.75	360.00	512.86	120.00	780.00	75.279	0.001*
Total weekly PA	2206.92	1780.00	1619.27	960.00	3060.00	1697.54	1370.00	1326.82	740.00	2295.00	2958.09	2490.00	2305.92	1180.00	4170.00	2346.86	2000.00	1682.20	1110.00	3262.50	141.011	0.001*
Weekday sitting daily minutes	367.88	360.00	168.29	240.00	480.00	373.72	360.00	180.18	240.00	480.00	354.35	322.00	195.68	200.00	480.00	329.70	300.00	178.20	197.25	480.00	22.049	0.001*
Weekend sitting daily minutes	299.03	300.00	176.71	180.00	360.00	333.07	300.00	187.76	180.00	480.00	328.41	300.00	210.67	180.00	480.00	301.68	300.00	184.63	180.00	420.00	17.576	0.001*

Notes: * statistically significant $p<0.001$; ** statistically significant $p<0.05$.

Table 3. PA of the studied students by gender (min/week)

IPAQ (minutes per week)	Females					Males					Mann-Whitney U test	
	Mean	Median	SD	IQR (25^{th}-75^{th} percentile)		Mean	Median	SD	IQR (25^{th}-75^{th} percentile)			
				25^{th} percentile	75^{th} percentile				25^{th} percentile	75^{th} percentile	Z	*p*
Job-related activities	784.40	570.00	761.26	180.00	1200.00	1028.06	860.00	836.78	360.00	1528.75	-7.469	0.000*
Transportation	847.15	730.00	539.74	435.50	1180.00	858.73	762.50	544.34	450.00	1170.00	-0.661	0.508
Active transportation	430.10	315.00	381.50	150.00	627.50	433.98	340.00	391.95	140.00	630.00	-0.035	0.972
Housework PA	417.31	210.00	575.32	60.00	550.00	525.00	287.50	675.47	80.00	731.25	-3.941	0.000*
Recreational activities	458.68	315.00	470.83	120.00	630.00	515.87	360.00	550.89	120.00	740.00	-1.320	0.187
Weekly moderate activities	1699.47	1350.00	1359.35	710.00	2284.50	1882.84	1540.00	1452.63	762.50	2580.00	-3.117	0.002**
Weekly vigorous activities	391.71	240.00	463.86	60.00	540.00	624.12	500.00	594.81	128.00	960.00	-10.016	0.000*
Total weekly PA	2087.70	1632.50	1674.45	870.00	2820.00	2512.89	2070.00	1895.21	1125.00	3510.00	-5.699	0.000*
Weekday sitting daily minutes	365.41	360.00	173.83	240.00	480.00	339.45	300.00	195.81	180.00	480.00	-3.744	0.000*
Weekend sitting daily minutes	316.70	300.00	185.12	180.00	420.00	316.65	300.00	201.17	180.00	480.00	-0.922	0.356

Notes: * The differences are statistically significant $p<0.001$; ** The differences are statistically significant $p<0.005$.

Discussion

PA among students in the Visegrad Group countries constitutes a significant element of young adults' lifestyle; however, its level, determinants, and dynamics show considerable variation. Analysis of literature allows for the identification of common trends and specific differences arising from cultural, social, and educational contexts.

Results from several years ago indicate an alarmingly low level of PA among Polish students. According to studies by Szreniawa and Zwierzchowska [23], only 15.2% of students met the WHO recommendations for PA (150 minutes of moderate activity per week). In a study by Grabowska [24] conducted at the Medical University in Wrocław, as many as 40.3% of students showed a low level of activity, and females more often than males declared lack of time and fatigue as the main barriers. Additionally, research by Biernat and Tomaszewski showed that students from large cities are more active than their peers from smaller centers, which may be due to better access to sports infrastructure [25]. In the present study, it was observed that the highest total PA level occurred among students from Poland.

In the Czech Republic, PA among students in research from over a decade ago was high, particularly among students of physical education (PE). Hes et al. demonstrated that 78% of PE students engaged in PA at least 3 times a week, compared to 52% of humanities students [26]. Males were significantly more active than females ($p<0.05$), and their motivations included improving fitness, competition, and personal development. Females more frequently indicated relaxation and stress reduction as their main goals for activity [27]. In a 2024 study, Hes et al. confirmed that regular PA correlates with higher functional fitness, better coordination, and higher self-esteem levels [28].

In Hungary, Ács et al. showed that only 28% of students at University of Pécs maintained regular PA during the lockdown [29]. Females reduced their activity more often than males, which the authors attribute to greater emotional and social burden. In a 2016 study, 34% of Hungarian students were physically active at least 5 times a week, with health and stress reduction being the main motivations [30]. The current study found that among students from the Visegrad Group countries, the least active, considering total PA values, were students from Hungary, with a median of 1,370 min/week vs. 2,490 min/week for students from Poland.

In Slovakia, Melichar et al. analyzed readiness for PA among 1,135 students [31]. Although 62% declared a willingness to engage in activity, only 31% did so regularly. In a study by Ács et al. comparing Visegrad Group universities, Slovak students showed the lowest level of leisure-time PA – only 19% were active daily [30]. Conversely, research by Kováč et

al. showed that students from technical universities were less active than their peers from pedagogical fields, which may be due to differences in the structure of classes and academic workload [32].

Gender differences are evident across all the Visegrad Group countries. In a study by Ács et al. [30] involving 4,000 students from the Czech Republic, Poland, Slovakia, and Hungary, males were on average 20-30% more active than females. Females more frequently indicated psychological barriers (shame, lack of self-confidence), while males more often declared a lack of time or laziness. It is worth noting that these differences are consistent with previous research on secondary school pupils in these countries [33]. On the other hand, it should be emphasized that females from Slovakia achieved significantly higher levels of PA than their peers from Poland and the Czech Republic, while among males, the differences between countries were smaller [34].

Research by Biernat and Piątkowska [35] showed that females more often than males choose recreational activities (e.g. yoga, Pilates), while males prefer team sports and strength training. In the present study, male students exhibited statistically significantly higher values of overall PA compared to female students. As mentioned earlier, male students participated in more vigorous activities than females, as evidenced by a more than two-fold higher median value for vigorous-intensity efforts (500 min/week vs. 240 min/week).

Analyzing the barriers and motivations accompanying students in undertaking PA, the most frequently indicated barriers across the entire Visegrad Group are: lack of time (over 60% of respondents), fatigue (45-55%), lack of motivation (30-40%), and lack of access to sports infrastructure (20-30%). Motivations for PA differ by gender and country. In the Czech Republic and Hungary, health motivation and stress reduction dominate; in Poland – improving physique and appearance; and in Slovakia – the need for social integration [24,30].

The gathered data indicate the need to implement differentiated strategies promoting PA among students, considering gender, field of study, and cultural context. Universities should offer flexible forms of activity (e.g. online classes, recreational sports) and conduct educational campaigns strengthening internal motivation. International cooperation within the Visegrad Group can serve as a platform for the exchange of best practices and the joint development of health-promoting programs.

Conclusions

This study provides valuable information on the PA undertaken by the young generation from Central European countries, demonstrating significant associations between vigorous and moderate-intensity effort, specific domains of PA (work and household), and gender.

The results confirmed that gender is a statistically significant variable differentiating the level of PA among students from the Visegrad Group countries, in favor of males.

In the academic context, an active lifestyle and its benefits can be multi-faceted. The differences in declared PA observed between students from individual countries (universities) may indicate distinctions in study programs, pointing to the need to design more effective educational strategies and student support systems. We believe that such initiatives can serve as catalysts for promoting an active lifestyle, thereby limiting sedentary behavior among the young generation not only in Central Europe.

In future studies, it would be worth considering deepening the analysis of psychological, environmental, and socio-economic factors that may influence PA. It would also be reasonable to use longitudinal methods to better capture the dynamics of changes in PA levels over time and to assess the effectiveness of interventions aimed at increasing it. Such an approach could further strengthen our understanding of the mechanisms regulating the health behaviors of young adults.

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