

PHYSICAL ACTIVITY OF UKRAINIAN AND POLISH MEDICAL STUDENTS IN THE BEGINNING OF THE WAR IN UKRAINE

AKTYWNOŚĆ FIZYCZNA UKRAIŃSKICH I POLSKICH STUDENTÓW MEDYCYNY NA POCZĄTKU WOJNY W UKRAINIE

Bartosz Bogusz Adamczak^{1(C,D,E,F)}, Zofia Kuźnik^{1(E,F)}, Szymon Makles^{1(E,F)}, Aureliusz Kosendiak^{2(A,B)}

¹ Student Scientific Association, Department of Physical Education and Sport, Wrocław Medical University, Wrocław, Poland

² Department of Physical Education and Sport, Wrocław Medical University, Wrocław, Poland

Authors' contribution

Wkład autorów:

- A. Study design/planning
zaplanowanie badań
- B. Data collection/entry
zebranie danych
- C. Data analysis/statistics
dane – analiza i statystyki
- D. Data interpretation
interpretacja danych
- E. Preparation of manuscript
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Summary

Background. The war in Ukraine has had profound implications for public health and mental well-being. Physical activity (PA) has been recognized for its beneficial impact on mental health, yet the effects of war on exercise behavior remain poorly understood. This study aimed to investigate variables related to PA in Ukrainian medical students compared to their Polish counterparts in the beginning of the war in Ukraine.

Material and methods. The study involved 225 participants from medical universities in Wrocław, Poland (n=120), as well as Lviv (n=49) and Ivano-Frankivsk (n=56), Ukraine. Data collection took place between May and July 2022. PA levels were assessed using the International PA Questionnaire, measured in Metabolic Equivalent of Task minutes per week (MET-min/wk). Additionally, a custom questionnaire was utilized to evaluate PA barriers, motives, and preferred forms of activity.

Results. Ukrainian students demonstrated significantly higher overall PA compared to Polish students (Total MET: Lviv 3759.0 MET-min/wk and Ivano-Frankivsk 4452.0 MET-min/wk vs. Wrocław 2841.8 MET-min/wk, $p < 0.001$). Walking and cycling emerged as the most prevalent forms of PA. The primary barrier to PA in Poland was a lack of time, while lack of motivation was more prominently displayed in Ukraine. Notably, an increase in self-esteem appeared to be a more prevalent motive in Ukraine ($p < 0.0001$).

Conclusions. Further investigation is warranted to understand the underlying reasons for the observed differences. It is crucial to ascertain whether increased PA in Ukraine is a coping mechanism for stress or attributed to other factors. Additionally, longitudinal studies are needed to identify emerging trends and changes in the population's response over time.

Keywords: armed conflicts, Ukraine, physical activity, Poland, students

Streszczenie

Wprowadzenie. Wojna w Ukrainie ma znamienny wpływ na zdrowie publiczne i samopoczucie psychiczne. Pozytywny wpływ aktywności fizycznej (AF) na zdrowie psychiczne jest powszechnie znany, jednak skutki wojny wpływające na zachowania związane z ćwiczeniami fizycznymi są wciąż słabo zrozumiane. Celem badań było ustalenie zmiennych związanych z AF wśród ukraińskich studentów medycyny w porównaniu z polskimi studentami na początku wojny w Ukrainie.

Materiał i metody. Badania obejmowały 225 uczestników z uniwersytetów medycznych: we Wrocławiu w Polsce, (n=120) oraz we Lwowie (n=49) i Iwano-Frankiwsku (n=56) w Ukrainie. Dane zebrane zostały między majem a lipcem 2022 roku. Poziomy AF zostały ocenione za pomocą Międzynarodowego Kwestionariusza AF oraz podane w ekwiwalencie metabolicznym w minutach na tydzień (MET-min/tydz.). Dodatkowo wykorzystano własny kwestionariusz do oceny barier, motywów i preferowanych form AF.

Wyniki. Ukraińscy studenci wykazali wyższy ogólny poziom AF w porównaniu do polskich rówieśników (Total MET: Lwów 3759.0 MET-min/tydz. i Iwano-Frankiwsk 4452.0 MET-min/tydz. vs. Wrocław 2841.8 MET-min/tydz., $p < 0.0001$). Chodzenie i jazda na rowerze były najczęściej wymienianymi formami AF. Główną barierą uprawiania AF w Polsce był brak czasu, podczas gdy w Ukrainie większą rolę odgrywał brak motywacji. Warto zauważyć, że wzrost samooceny jako motyw uczestnictwa w AF był istotnie częściej podawany w Ukrainie ($p < 0.0001$).

Wnioski. Dalsze badania są uzasadnione, w celu zrozumienia przyczyny obserwowanych różnic. Istotne jest ustalenie, czy zwiększona aktywność fizyczna w Ukrainie jest mechanizmem radzenia sobie ze stresem czy związana z innymi czynnikami. Dodatkowo, niezbędne są badania długofalowe, celem zidentyfikowania ewoluujących trendów i zmian reakcji populacji w czasie.

Słowa kluczowe: konflikty zbrojne, Ukraina, aktywność fizyczna, Polska, studenci

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Address for correspondence / Adres korespondencyjny: Bartosz Bogusz Adamczak, Department of Physical Education and Sport, Wrocław Medical University, Wojciecha z Brudzewa St. 12a, 51-601 Wrocław, Poland, e-mail: bartosz.adamczak@student.umw.edu.pl, phone: +48 71 348 65 09.

ORCID: Bartosz Bogusz Adamczak, <https://orcid.org/0000-0003-0930-3334>, Zofia Kuźnik, <https://orcid.org/0000-0002-0399-929X>, Szymon Makles <https://orcid.org/0009-0008-5027-2713>, Aureliusz Kosendiak <https://orcid.org/0000-0003-2075-5438>.

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Introduction

The war in Ukraine, which started on 24th February 2022, caused a massive displacement of people, creating a new humanitarian crisis in Ukraine. This crisis has resulted in significant short- and long-term public health concerns [1] and has led to a significant rise in commodity prices, posing a risk to global economic activity [2,3].

The destructive impact of war on an individual's mental health is widely recognized [4]. The war of Crimea and Donbas in 2014 caused a high prevalence of mental health issues among internally displaced persons, including PTSD, depression, anxiety, somatization and hazardous alcohol use [5]. These negative effects can be immediate, long-term and intergenerational. Prolonged grief is common due to the high number of deaths, with casualties estimated to be in the thousands [6].

The Croatian population after the Yugoslavian war showed lower physical activity (PA) in war-affected areas, leading to worsened fitness [7]. Multiple studies concluded that exercise improves mental well-being and helps manage mental health conditions. Individuals with high trait anxiety may prefer PA for its psychological and physiological benefits [8]. Individuals who engage in routine physical exercise exhibit lower levels of perceived stress, while those who lead sedentary lifestyles demonstrate higher levels of perceived stress [9]. PA such as yoga has been found to reduce PTSD symptoms related to war experiences by enhancing functioning and aiding in physical and sensory tolerance, emotional awareness and affect tolerance [10].

Studies show students' motivations for exercise are primarily external, focusing on appearance, weight management and stress reduction. In young adults, autonomous motivation, which encompasses intrinsic motivation and identified regulation, positively correlates with PA behavior, while introjected regulation correlates positively, and external regulation correlates negatively [11]. Nevertheless, considering external stressors, such as the presence of war, is crucial, as they may lead to changes in motivation to exercise.

This study aims to compare motivations, barriers and PA levels between Ukrainian and Polish medical students during the beginning of the war in Ukraine. A group of Polish individuals was included for comparative analysis, as they were not directly exposed to the conflict. These groups exhibit comparability due to shared attributes encompassing linguistic, cultural, geographical and historical elements [12,13]. Consequently, akin behavioral patterns related to PA can be expected. The results will reveal the exercise habits of students experiencing anxiety and stress during the war.

This research group is of particular interest due to their anticipated future professions in the medical field, which necessitate a high degree of resilience to diverse workplace stressors [14]. Additionally, these students are expected to promote healthier lifestyles to their patients, which may be accomplished, in part, through their habits, given their essential social role [15]. As a result, monitoring PA habits and coping mechanisms employed by medical degree students is crucial.

Material and methods

Participants

This cross-sectional study, conducted in 2022, aimed to compare PA levels among medical students affected by the war. The study included three universities: Wroclaw Medical University (Poland), Danylo Halytsky Lviv National Medical University (Ukraine) and Ivano-Frankivsk National Medical University (Ukraine). Inclusion criteria included being a medicine student, being between 18-30 years of age and providing consent for research. Exclusion criteria included chronic illness during the study and non-compliance with verification questions. The study was approved by the Ethics Committee of the Wroclaw Medical University (No. KB – 596/2022).

Participants were recruited through university emails, physical education classes and student councils. The online questionnaire consisted of the International Physical Activity Questionnaire and the Own Questions

Questionnaire covering war-related aspects, exercise types, motives and barriers. Data collection took place between May and July 2022. This period was selected because of the similar climate in the geographical area during these months, which is favorable for outdoor PA, allowing potential differences to be more noticeable. A total of 400 students were invited, resulting in 140 eligible responses from Poland and 125 from Ukraine. After verification, a total of 225 participants, from one medical university in Poland (Wrocław, n=120) and from two medical universities in Ukraine (Lviv, n=49; Ivano-Frankivsk, n=56), were included in the final analysis.

Evaluation methods and instruments

The short Polish version of the International Physical Activity Questionnaire (IPAQ) was used to measure and compare the PA of the participants. As the study shows, the completion of the questionnaire by respondents may exaggerate the results; therefore, all participants of the survey were trained by our research team [16]. The results were presented in energy expenditure expressed in MET units, i.e. the equivalent of resting metabolism. This is equal to the consumption of 3.5 mL of oxygen per kilogram of body weight per minute. In resting metabolism, MET level=1. The questionnaire divided the respondents according to the following values: for walking MET=3.3; for moderate intensity MET=4; for vigorous activities MET=8 [17]. Most of the data, unless noted otherwise, was given in minutes per week (min/wk).

The survey's "metrics" section collected basic participant information such as age, gender, height, weight and place of residence classified by city size. Body Mass Index (BMI) was calculated based on this data. The survey's final part focused on the start of the war and participants' PA. It asked about their types of PA, reasons for engaging in them and obstacles encountered.

Statistical analysis

Excel (Microsoft, Redmond, WA, USA) and Statistica 13 (Statsoft, Kraków, Poland) were used for statistical analysis. The distribution of obtained values was assessed using the Shapiro-Wilk W-test. Descriptive analysis included frequencies, percentages, medians and Interquartile Range [IQR]. The Mann-Whitney U test compared scores between two variables, while the Kruskal-Wallis test compared three or more variables; with appropriate effect sizes listed. The Chi-square (χ^2) test compared nominal variables like PA levels and location. The significance level was set at $p < 0.05$ for all analyses. Effect sizes were calculated for the Mann-Whitney non-parametric U test (r), for Kruskal-Wallis test as the Partial Eta Squared (η^2), and for Chi-square the Cramers-V (V).

Results

Table 1 provides an overview of the respondents' characteristics. The average age of respondents was below 20 years across all locations; moreover, there was a higher proportion of women. Around 20% of respondents exhibited abnormal body weight. In Ukraine, the majority resided in the largest cities (approximately 90%), while in Poland, the largest cities were the most common but less popular choice (39.2% resided in rural areas or smaller cities).

Table 1. Characteristics of study participants

Variables	Overall sample n=225 (%) [IQR]	Wroclaw Poland, n=120 (%) [IQR]	Lviv Ukraine, n=49 (%) [IQR]	Ivano-Frankivsk Ukraine, n=56 (%) [IQR]
Mean age	19.4 [18.0-20.0]	19.5 [19.0-20.0]	18.8 [19.0-19.0]	19.6 [18.0-21.0]
Gender				
Male	62 (27.6)	40 (33.3)	4 (8.2)	18 (32.1)
Female	163 (72.4)	80 (66.7)	45 (91.8)	38 (67.9)
BMI				
Mean	21.5 [19.6-22.9]	21.5 [19.5-23.0]	21.2 [19.3-22.6]	21.9 [20.5-23.0]
Underweight (<18.5)	19 (8.4)	11 (9.2)	5 (10.2)	3 (5.4)
Normal (18.5-24.9)	185 (82.2)	99 (82.5)	39 (79.6)	47 (83.9)
Overweight (>25)	21 (9.3)	10 (8.3)	5 (10.2)	6 (10.7)
Place of residence				
Rural area	31 (13.8)	24 (20.0)	4 (8.2)	3 (5.4)
City <20,000*	14 (6.2)	14 (11.7)	0 (0.0)	0 (0.0)
City 20,000 – 100,000*	40 (17.8)	35 (29.2)	2 (4.1)	3 (5.4)
City >100,000*	140 (62.2)	47 (39.2)	43 (87.7)	50 (89.3)

Note: n – the number of observations; * – the number of inhabitants.

Table 2 displays the MET levels of respondents based on their place of residence. Students from cities in Ukraine had significantly higher total PA levels compared to those from Poland ($p < 0.0001$). This difference was mainly driven by higher PA during walking, although Moderate MET and Vigorous MET also varied significantly. No significant differences were observed between the PA MET scores within Ukrainian cities. Physically inactive individuals represented a small group in both cities. However, a notable difference was seen in the proportion of individuals whose PA improved their health (HEPA). Ukraine had a significantly higher percentage, approximately 75%, compared to Poland's 50% ($p = 0.003$).

Table 2. Comparison of PA levels by place

Variables	Overall sample n=225 (%) [IQR]	Wroclaw Poland, n=120 Median (%) [IQR]	Lviv Ukraine, n=49 Median (%) [IQR]	Ivano-Frankivsk Ukraine, n=56 Median (%) [IQR]	p-value	Effect size
PA MET-min/wk						
Walking MET	1386.0 [924.0-2772.0]	1386.0 [693.0-1570.0]	2079.0 [1584.0-2772.0]	1782.0 [1386.0-2772.0]	$p < 0.0001$	$\eta^2 = 0.16$
Moderate MET	540.0 [240.0-960.0]	480.0 [240.0-720.0]	480.0 [240.0-1080.0]	720.0 [480.0-1200.0]	$p = 0.03$	$\eta^2 = 0.02$
Vigorous MET	960.0 [400.0-1920.0]	720.0 [320.0-1440.0]	1440.0 [200.0-1920.0]	1440.0 [720.0-2400.0]	$p = 0.017$	$\eta^2 = 0.03$
Total MET	3546.0 [2373.0-4986.0]	2841.8 [1904.0-4239.0]	3759.0 [2772.0-5736.0]	4452.0 [3022.5-6518.0]	$p < 0.0001$	$\eta^2 = 0.12$
PA level						
Inactive	4 (1.8)	3 (2.5)	1 (2.0)	0 (0.0)	$p = 0.003$	V=0.13
Minimally active	84 (37.3)	58 (48.3)	13 (26.5)	13 (23.2)		
HEPA	137 (60.9)	59 (49.2)	35 (71.4)	43 (76.8)		

Table 3 displays the MET scores by city of residence and gender. Women from both Ukrainian cities had significantly higher PA levels compared to women from Poland, particularly in Walking MET, Vigorous MET and Total MET ($p < 0.0001$, $p = 0.0012$ and $p < 0.0001$, respectively). No significant differences were observed among men. Notably, women in Poland achieved lower Vigorous MET levels compared to men ($p = 0.0015$). Further analysis showed that women in Poland had lower PA levels compared to all other groups. Men were more likely to be classified in the HEPA group based on PA levels.

Table 3. Comparison of PA levels by gender and place

Variables	Wroclaw Poland, n=120 Median (%) [IQR]	Lviv Ukraine, n=49 Median (%) [IQR]	Ivano-Frankivsk Ukraine, n=56 Median (%) [IQR]	p-value ¹	Effect size
Walking MET					
Female	1386.0 [693.0-1455.0]	2376.0 [1584.0-2772.0]	2772.0 [1386.0-2772.0]	$p < 0.0001$	$\eta^2 = 0.21$
Male	1386.0 [643.5-2194.5]	2079.0 [1732.5-2079.0]	1386.0 [1386.0-1386.0]	$p = 0.25$	$\eta^2 = 0.01$
p-value ²	$p = 0.95$	$p = 0.32$	$p = 0.003$	-	-
Effect size	$r = 0.01$	$r = 0.14$	$r = 0.40$	-	-
Moderate MET					
Female	480.0 [240.0-720.0]	480.0 [240.0-1080.0]	600.0 [480.0-1200.0]	$p = 0.13$	$\eta^2 = 0.01$
Male	510.0 [240.0-1020.0]	560.0 [560.0-1480.0]	1200.0 [540.0-1200.0]	$p = 0.13$	$\eta^2 = 0.04$
p-value	$p = 0.45$	$p = 0.18$	$p = 0.14$	-	-
Effect size	$r = 0.07$	$r = 0.19$	$r = 0.20$	-	-
Vigorous MET					
Female	720.0 [240.0-1240.0]	1440.0 [200.0-1920.0]	1440.0 [720.0-2160.0]	$p = 0.012$	$\eta^2 = 0.04$
Male	1440.0 [660.0-2160.0]	1120.0 [1120.0-2960.0]	2400.0 [1080.0-2400.0]	$p = 0.33$	$\eta^2 = 0.004$
p-value	$p = 0.0015$	$p = 0.68$	$p = 0.25$	-	-
Effect size	$r = 0.29$	$r = 0.06$	$r = 0.16$	-	-
Total MET					
Female	2586.0 [1705.5-3806.3]	4158.0 [2772.0-5736.0]	4665.0 [3039.0-6558.0]	$p < 0.0001$	$\eta^2 = 0.19$
Male	3445.5 [2440.5-4719.0]	3759.0 [3759.0-6172.5]	3006.0 [3006.0-4986.0]	$p = 0.36$	$\eta^2 < 0.0001$
p-value	$p = 0.005$	$p = 0.56$	$p = 0.62$	-	-
Effect size	$r = 0.25$	$r = 0.08$	$r = 0.08$	-	-
PA level - Females					
Inactive	2 (2.5%)	1 (2.2)	0 (0.0)	$p = 0.002$	$V = 0.17$
Minimally active	45 (56.3)	13 (28.9)	9 (23.7)		
HEPA	33 (41.3)	31 (68.9)	29 (76.3)		
PA level - Males					
Inactive	1 (2.5)	0 (0.0)	0 (0.0)	$p = 0.56$	$V = 0.11$
Minimally active	13 (32.5)	0 (0.0)	4 (22.2)		
HEPA	26 (65.0)	4 (100.0)	14 (77.8)		

Notes: ¹ – comparison between the nations; ² – comparison between genders.

Table 4 presents the most commonly reported types of PA. The results show that irrespective of the country, the most frequently practiced activities were walking and cycling. Fitness and gym workouts were also prevalent. Notably, in Lviv, more than 75% of respondents reported dancing as a form of PA, whereas in other cities, no more than 25% of individuals chose this option.

Table 4. Practiced forms of PA

Practiced form of PA	Wroclaw Poland, n=120	Lviv Ukraine, n=49	Ivano-Frankivsk Ukraine, n=56	p-value
Walks	59.2%	57.1%	55.4%	$p=0.89$
Cycling	52.5%	44.9%	55.4%	$p=0.54$
Basketball	13.3%	2.0%	17.0%	$p=0.04$
Volleyball	31.7%	18.4%	26.8%	$p=0.21$
Football	10.8%	22.5%	23.2%	$p=0.05$
Swimming	32.5%	34.7%	37.5%	$p=0.81$
Gym	36.7%	38.8%	46.4%	$p=0.46$
Fitness	36.7%	30.6%	19.6%	$p=0.08$
Athletics	12.5%	16.3%	19.6%	$p=0.45$
Tennis	20.8%	32.7%	19.6%	$p=0.20$
Table tennis	13.3%	28.6%	14.3%	$p=0.047$
Martial arts	15.0%	20.4%	25.0%	$p=0.27$
Horse riding	4.2%	18.4%	7.1%	$p=0.008$
Dance	23.3%	77.5%	14.3%	$p<0.0001$

Table 5 presents barriers and motives for PA. Lack of time was the main barrier for Polish students, while lack of motivation was prominent for Ukrainian students. In Ukraine, improving self-esteem was a common motive (two-thirds), whereas in Poland, this was less frequent (one-third). Weight management as a motive was three times more likely in Ukraine (~30%) despite a lower prevalence of overweight individuals (~10%). Aesthetic goals and health maintenance/improvement were popular motives in both countries. All respondents recognized the positive impact of PA on health.

Table 5. Barriers and motives to engaging in PA

Barriers	Wroclaw Poland, n=120	Lviv Ukraine, n=49	Ivano-Frankivsk Ukraine, n=56	p-value
Lack of time	78.3%	63.3%	37.5%	$p<0.0001$
Lack of motivation	30.8%	69.4%	64.3%	$p<0.0001$
Lack of base	5.8%	26.5%	7.1%	$p<0.0001$
Health problems	11.7%	16.3%	21.4%	$p=0.23$
Motives				
Improving fitness	83.3%	98.0%	100.0%	$p=0.0003$
Maintaining fitness	66.7%	59.2%	67.9%	$p=0.59$
Improving or maintaining health	53.3%	65.3%	80.4%	$p=0.002$
Improving self-discipline	44.2%	38.8%	42.9%	$p=0.81$
Improving self-esteem	36.7%	71.4%	60.7%	$p<0.0001$
Improving self-confidence	37.5%	55.1%	39.3%	$p=0.10$
Improving character traits	27.5%	14.3%	19.6%	$p=0.15$

Barriers	Wroclaw Poland, n=120	Lviv Ukraine, n=49	Ivano-Frankivsk Ukraine, n=56	p-value
Desire to prove oneself	33.3%	20.4%	39.3%	$p=0.11$
Fight against excess weight	11.7%	32.7%	32.1%	$p<0.0008$
Esthetic goals	55.8%	51.0%	64.3%	$p=0.37$
Escape from boredom	31.7%	44.9%	37.5%	$p=0.26$
Fight against depression	32.5%	28.6%	32.1%	$p=0.88$
Regaining purpose and meaning in life	23.3%	20.4%	17.9%	$p=0.70$
Fighting addictions	6.7%	8.2%	10.7%	$p=0.65$

Discussion

This research assesses PA behaviors, incentives, barriers and modalities among medical university students in Wroclaw, Poland, and two Ukrainian cities (Ivano-Frankivsk and Lviv) during the ongoing war in Ukraine. These urban centers have populations exceeding 100,000 residents, and some participants commute from rural areas. The majority of respondents were female, reflecting the higher enrollment of female students in medical universities [18].

In accordance with our investigation among medical students in Wroclaw, it was observed that 9.2% of the respondents had a BMI indicating underweight (<18.5), while 8.3% of the participants were classified as overweight (>25). In the city of Lviv, the study identified that 10.2% of the respondents were underweight, and 10.2% were overweight. Furthermore, in Ivano-Frankivsk, 5.4% of the participants were underweight, and 10.7% were classified as overweight.

The findings of this investigation demonstrate a favorable outcome in the prevalence of overweightness among participants in contrast to several studies conducted on different populations, for instance, in Poland (36.3%) [19] and Spain (30.3%) [20].

In an investigation targeting the adult population of Ukraine, 15.9% of adult males were obese, with 45.6% overweight. Among females, 31.8% were overweight, and 13.5% were obese [21]. In a 2020 study among college students from Poland, Ukraine and Hungary, 19.4% were overweight and 10.75% were underweight [22], whereas among American college students, around 33% were identified as overweight [23].

A study among students at Wroclaw Medical University in Poland found a significant increase in the proportion of overweight individuals from 10% in 2020 to 15% in 2021. The percentage of underweight individuals decreased from 12% to 10%. In total, approximately 23.5% of respondents had abnormal BMI levels in both the initial and follow-up surveys [24]. Based on our investigation, it appears that the prevalence of abnormal BMI levels among students enrolled in Wroclaw Medical University has decreased to 17.5% in 2022.

A study conducted in 2014 on Ukrainian students found that male students had higher overall PA levels (3,863 MET-min/wk) compared to female students (3,365 MET-min/wk) [25]. Another study in Ukraine reported a Total MET of 3,560 min/wk among students [26]. In 2018, a study comparing PA in Ukrainian and Visegrad country students found that Ukrainian students had a Total MET-min/wk of 4,233.4, while Visegrad country students amounted to 5,588.5 MET-min/wk [27]. Ukrainian participants also had a higher prevalence of healthy BMI. In Poland, medical students had a total of 2,841.8 MET-min/wk, while in Lviv and Ivano-Frankivsk (Ukraine), students had 3,759.0 and 4,452.0 MET-min/wk, respectively, with Ukrainian women being more active than Polish women. A study on medical students in Wroclaw during the COVID-19 pandemic showed an increase in Total MET from 1,615.7 (October 2020) to 1,865.9 MET-min/wk (March 2021) [22]. It is noteworthy to mention that Ukrainian students from both cities had higher PA levels compared to their Polish counterparts.

Analysis showed a significant difference between Polish and Ukrainian students, particularly in Walking MET-min/wk. Wrocław students had a median value of 1,386.0 MET-min/wk, while Lviv and Ivano-Frankivsk students had values of 2,079.0 MET-min/wk and 1,782.0 MET-min/wk, respectively. The scarcity of secure transportation in Ukraine and high gasoline prices linked to the war in Ukraine may contribute to this difference. Moderate MET-min/wk and Vigorous MET-min/wk values were also significantly higher among Ukrainian students.

In October 2020, a majority of Polish students (77.7%) were physically inactive, and only 11.6% achieved Health-Enhancing Physical Activity (HEPA) criteria. The following year, the numbers slightly changed to 80.7% physically inactive and 9.3% meeting HEPA standards [24]. In our study, the prevalence of physically inactive individuals was generally low (0-2.5%). There was a significant difference in the proportion of individuals achieving HEPA levels, with up to three-quarters in Ukraine and approximately half in Poland. This indicates a positive trend towards increased PA among students at Wrocław Medical University.

In a 2021 study, motives for attending Physical Education classes among Ukrainian university students were examined [28]. The findings revealed that receiving course credits (57%) and body strengthening (47.9%) were significant motivators. Male students prioritized improving physical efficiency (26.5%), while female students prioritized the desire to become fit (35.2%) [28]. Our study revealed walking and cycling as popular activities across all locations. Lviv students showed a higher preference for dance, while basketball and football were more popular among Ivano-Frankivsk students. These preferences may be influenced by issues with public transport and gasoline prices, making walking and running more affordable and convenient modes of transportation [2,3].

A 2017 study of Ukrainian students found that walking and running were popular activities, with dancing more prevalent among female students [29]. Both genders had similar participation levels in cycling and volleyball, while aerobic fitness was more common among females and table tennis among males. Activities like skating, swimming, basketball, football and roller skating had varying levels of participation for each gender [29]. Similar PA choices among Polish and Ukrainian medical students can be attributed to the high number of female students. In Lviv, where most participants were women, dancing was the preferred PA, consistent with previous research on female preferences.

In a 2019 study on Lithuanian and Polish students [30], fitness/health was the primary motive for PA, followed by stress/mood, enjoyment/socializing and weight/appearance. Lack of support and motivation were barriers. Positive correlations were found between motives, while fitness/health correlated negatively with barriers [30].

In our 2022 study on medical students, lack of time was the most reported barrier in Poland (78.3%), while lack of motivation was more prevalent among Ukrainian students, particularly in Lviv (69.4%) and Ivano-Frankivsk (64.3%). Improving fitness was the most common motive across all groups, with Ivano-Frankivsk students having the highest percentage (100%). Improving or maintaining health was also a significant motive, especially among Ivano-Frankivsk students (80.4%). Ukrainian students emphasized improving self-esteem, health and weight loss more than Polish students. The reason for these differences needs future research.

The presented research has limitations due to its cross-sectional nature and the specific sample of medical students from Wrocław, Lviv and Ivano-Frankivsk. The small number of male respondents may affect the accuracy of their lifestyle and health data. The inclusion of Physical Education classes for Polish students may influence their exercise habits and data reliability. The online survey could lead to interpretation errors and inconsistent responses. Generalizations to the adult population should be avoided. Further research with a broader group is recommended to build upon these findings.

Based on our research, it would be advantageous to introduce countermeasures to address the issue of insufficient PA among students. Specifically, implementing practical courses that promote more appealing ways of intensive physical exercise for female students is recommended. Moreover, conducting further research to identify the underlying reasons for this trend can lead to the elimination of causes more effectively.

Conclusions

This research explored PA behaviors among medical students in Wroclaw, Poland, and two Ukrainian cities. The study observed a decrease in abnormal BMI levels among Wroclaw Medical University students in 2022 compared to 2021. Ukrainian male students were more physically active than females, and overall, Ukrainian students were more active than Polish students. Walking was the most significant PA, where Ukrainian students demonstrated higher levels of MET. A larger proportion of Ukrainian students achieved HEPA level criteria compared to Polish students. The PA levels of Wroclaw medical students have increased since October 2020, but the majority are still inactive.

PA is important for university students in Ukraine and Poland, with fitness and health being key motives. Popular activities include walking, running and cycling. Lack of time and motivation are barriers, with motivation being more prevalent in Lviv and Ivano-Frankivsk. Ukrainian students prioritize self-esteem, health and weight loss more than Polish students. Cultural differences may contribute to these variations.

The ongoing war in Ukraine may influence barriers and motives for PA among Ukrainian medical students, with a lack of motivation being a significant barrier. Further research is needed to understand these differences. Overall, the studies presented highlight the importance of promoting PA and addressing barriers among university students.

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Bartosz Adamczak and Aureliusz Kosendiak have both contributed equally to this work and have the right to be listed as first author.

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