



# The level of physical activity of university students in Lublin, Białystok and Covilhã

Poziom aktywności fizycznej studentów uczelni wyższych w Lublinie, Białymstoku oraz Covilhã

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## Abstract

**Objectives.** The aim of the study is to determine the level and to compare the physical activity of students of the Medical University (MU) in Lublin and the University of Technology (BUT) in Białystok, Poland, and the University of Beira Interior (UBI) in Covilhã, Portugal.

**Materials and method.** A group of 823 people were examined: 108 students of the Medical University of Lublin, 118 students of Białystok University of Technology, and 597 students of the University of Beira Interior in Covilhã. The study examined the level of student activity using the IPAQ questionnaire.

**Results.** With reference to people (both women and men) studying at the MU in Lublin and at UBI in Portugal, the activity level was high, 60.2% and 51.8% respectively. In the group of BUT students sufficient activity prevailed – 30.5% of the respondents. Insufficient activity level was characterized by 2.8% of MU students, 23.7% of BUT students and 12.7% of surveyed Portuguese students. Considering the gender of respondents, statistically significant differences in activity levels among Portuguese students were observed. A sufficient level of physical activity was characterized by a higher percentage of men than women, 37.5% and 33.8%, respectively.

**Conclusions.** Students of the Medical University (MU), as well as Portuguese students, were characterized by a high level of physical activity, while students of the Białystok University of Technology (BUT) had an adequate level of physical activity. Among women studying at MU, BUT and UBI in Portugal, the highest average energy expenditure values were related to walking effort. Among both women and men studying at MU, BUT and at UBI in Portugal, the lowest average values of energy consumption were for moderate activity. Students from MU spent less time sitting during one working day than BUT and UBI Portuguese students.

## Key words

Poland, Portugal, the International Physical Activity Questionnaire IPAQ, student activity

## Streszczenie

**Cel pracy.** Celem pracy było określenie poziomu oraz porównanie aktywności fizycznej studentów Uniwersytetu Medycznego w Lublinie, Politechniki Białostockiej oraz Universidade de Beira Interior w Covilhã (Portugalia).

**Materiał i metody.** W badaniu poziomu aktywności wzięły udział 823 osoby – 108 studentów kierunku fizjoterapia oraz kierunku dietetyka Uniwersytetu Medycznego w Lublinie (UM), 118 studentów kierunku turystyka i rekreacja Politechniki Białostockiej (PB) oraz 597 studentów kierunku wychowanie fizyczne w Universidade de Beira Interior Covilhã (Portugalia). Badania przeprowadzono z wykorzystaniem krótkiej wersji Międzynarodowego Kwestionariusza Aktywności Fizycznej (International Physical Activity Questionnaire – IPAQ).

**Wyniki.** Biorąc pod uwagę studentów PB oraz UM, wystarczającym poziomem aktywności fizycznej charakteryzował się większy odsetek kobiet niż mężczyzn – odpowiednio 55,6% i 37,5% studentów PB oraz 42,3% i 23,3% studentów UM. Wysokim poziomem aktywności fizycznej cechował się większy odsetek mężczyzn niż kobiet, zarówno w grupie studentów PB, jak i UM. W odniesieniu do osób studiujących na PB wynosił on odpowiednio 31,3 i 29,6%, natomiast wśród osób studiujących na UM – 73,3% oraz 55,1%.

**Wnioski.** Studenci UM oraz z Portugalii charakteryzowali się wysokim, natomiast studenci PB wystarczającym poziomem aktywności fizycznej. Wśród kobiet studiujących na UM, PB oraz w Portugalii najwyższe średnie wartości wydatku energetycznego dotyczyły wysiłku związanego z chodzeniem. Zarówno wśród kobiet, jak i mężczyzn studiujących na UM, PB oraz w Portugalii najniższe średnie wartości zużycia energetycznego dotyczyły aktywności umiarkowanej. Studenci z UM spędzali mniej czasu na siedzeniu w ciągu jednego dnia roboczego niż studenci PB oraz z Portugalii.

## Słowa kluczowe

Polska, Portugalia, Międzynarodowy Kwestionariusz Aktywności Fizycznej IPAQ, aktywność fizyczna studentów

## INTRODUCTION

Physical activity is defined as any movement of the body generated by skeletal muscles requiring energy expenditure [1, 2, 3]. Any form of activity with a minimum of moderate intensity has a positive effect on the health of the body, and improves the quality of life of people with chronic diseases [4, 5, 6, 7]. According to data from the World Health Organization (WHO), experts recommend the accumulation of a half-hourly moderate-intensity physical activity for five days a week, or a minimum of twenty-minute intensive effort performed three times a week. A weekly physical activity recommended for people aged 18–64 is moderate-intensity exercise lasting at least 150 minutes, or high-intensity physical activity for at least 75 minutes, or a combination of moderate and high-intensity exercise [8, 9, 10, 11, 12]. Physical activity can be measured using several tools, among them questionnaires for checking the sports activity of children, adults aged 16–65, and the elderly, as well as assessing the impact of the level of physical activity on risk factors of diseases [13, 14, 15].

## MATERIALS AND METHOD

The study aimed to determine the level and compare the physical activity of students of the Medical University in Lublin and the Białystok University of Technology, and the Universidade de Beira Interior in Covilhã, Portugal. The study of the level of activity was carried out on 823 people: 108 students of physiotherapy and dietetics at the Medical University of Lublin (MU), 118 students of tourism and recreation at Białystok University of Technology (BUT), and 597 students of physical education at the University of Beira Interior Covilhã, Portugal. In the group of UM students, there were 78 women and 30 men aged  $19.33 \pm 1.15$  years, in the group of BUT students 54 women and 64 men aged  $20.53 \pm 2.28$  years were examined, while in the group of students from Portugal there were 283 women and 314 men aged  $20.72 \pm 2.21$  years. Detailed anthropometric characteristics of the studied groups are presented in Table 1.

The study was conducted using a short version of the International Physical Activity Questionnaire (IPAQ, which consists of seven questions relating to each type of physical activity, whether related to everyday life functioning, as

well as work or leisure. The questions relate to the time spent sitting, walking or performing moderate or intense activities by the respondent. According to the IPAQ rules, the duration of the efforts included in the survey should be at least 10 minutes (without a break). Intensive physical exertion is compared to lifting heavy objects or climbing stairs; this type of exertion is accompanied by strong breathing and an increased heart rate. Moderate exertion should be understood as performing activities such as lifting light objects or cycling at a normal pace. During this effort, it can be observed that breathing and heart rate are slightly accelerated [16, 17, 18, 19]. MET (Metabolic Equivalent of Task) intensity factors are used to assess the types of activity listed in the questionnaire. This parameter corresponds to multiple metabolisms at rest, determined based on oxygen uptake, which amounts to 3.5 ml of oxygen per one kilogram of body weight of 70 kg of a man during one minute [20, 21].

Concerning the short version of the IPAQ, the MET value is 3.3 for walking-related activities, 4.0 for moderate activities and 8.0 for intensive activities. To express a specific physical activity in the MET unit – minutes/week, multiply the activity coefficient of an activity given by the number of days it is performed during the week and the duration given in minutes (during one day). Weekly average physical exercise is calculated by summing-up the results of all types of physical activities and is expressed in MET units – minutes/week. Based on the results of physical activity, those surveyed can be qualified into one of three levels of activity: high, sufficient or insufficient. A high level includes individuals who have performed intense physical activity for three or more days (a total of at least 500 MET minutes/week), or for seven or more days of combined efforts (walking, moderate or intense effort) exceeding 3,000 MET minutes/week. Individuals classified as sufficiently qualified are who have performed intense physical activity lasting at least 20 minutes per day, or a minimum of five days per week of moderate or walking effort, lasting not less than 30 minutes a day, or who performed a combination of physical exertion (walking, moderate or intense) exceeding 600 MET – minutes/week for at least five days. An insufficient level was characterized by individuals who did not perform any physical effort, or were not qualified to a sufficient or high level [22, 23].

There is also a long-form of the IPAQ questionnaire which consists of five independent parts [24, 25, 26]. Both the long and short IPAQ questionnaires are reliable tools for collecting data distributor

Statistical analysis was conducted using the IBM SPSS Statistics programme (StatSoft Polska). Appropriate statistical procedures were used to verify the hypotheses. Two independent groups were compared with the Mann-Whitney U test. The Kruskal-Wallis test was used to compare more than two independent groups. In the case of demonstrated differences, multiple comparisons were made. The analysis also used the Bonferroni correction. Correlations between the qualitative variables were analyzed using the chi-square test of independence.

## RESULTS

With reference to the men and women studying at the MU in Lublin and UBI in Portugal, the dominant activity level was high, 60.2% and 51.8%, respectively. In the group of BUT

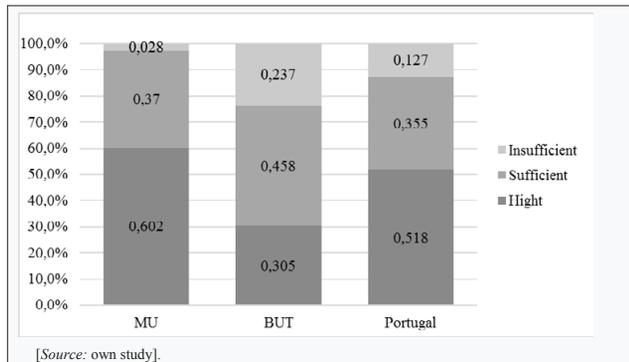
**Table 1.** Anthropometric characteristics of the examined groups of students by gender and age (n = 823)

Variables	Male		Female		Total		
	M	SD	M	SD	M	SD	
MU	Age (in years)	19.93	1.72	19.10	0.73	19.33	1.15
	Body weight (kg)	74.43	10.14	57.49	8.18	62.19	11.58
	Body height (m)	1.80	0.06	1.67	0.06	1.71	0.08
BUT	Age (in years)	20.41	1.80	20.69	2.76	20.53	2.28
	Body weight (kg)	67.52	12.69	62.91	9.86	65.41	11.67
	Body height (m)	1.72	0.08	1.70	0.07	1.71	0.07
Portugal	Age (in years)	20.89	2.10	20.52	2.31	20.72	2.21
	Body weight (kg)	72.04	9.10	58.13	8.05	65.43	11.07
	Body height (m)	1.77	0.06	1.64	0.06	1.70	0.09

Source: own study.

M – mean; SD – standard deviation

students, sufficient activity prevailed – 30.5% of the respondents. An insufficient activity level was characterized by 2.8% of MU students, 23.7% of BUT students and 12.7% of surveyed Portuguese students. The differences were statistically significant ( $p < 0.05$ ).



**Figure 1.** Levels of physical activity of Polish MU and BUT students, and Portuguese UBI students excluding gender ( $n = 823$ ) Pearson's chi- squared test value:  $\chi^2 = 33,560$ ;  $p < 0.001$

Considering the gender of respondents, statistically significant ( $p < 0.05$ ) differences were observed in the activity levels among Portuguese students. A sufficient level of physical activity was characterized by a higher percentage of men than women. Regarding the high level, women constituted a larger group compared to men.

Taking into account the MU and BUT students, a sufficient level of activity was characterized by a higher percentage of women than men. The greater percentage of men was characterized by a higher level of physical activity, in comparison to women, both in the group of MU and BUT students. The differences were not statistically significant ( $p > 0.05$ ). (Tab. 2).

**Table 2.** Physical activity levels of Polish MU and BUT students, and UBI Portuguese students compared by gender ( $n = 823$ )

Physical activity	MU			BUT			UBI		
	M %	F %	T %	M %	F %	T %	M %	F %	T %
High	73.3	55.1	60.2	31.3	29.6	30.5	46.6	56.4	51.8
Moderate (sufficient)	23.3	42.3	37.0	37.5	55.6	45.8	37.5	33.8	35.5
Low (insufficient)	3.3	2.6	2.8	31.3	14.8	23.7	15.9	9.9	12.7
Chi-Pearson's squared test value:	$\chi^2 = 3.345$ ; $p = 0.188$			$\chi^2 = 5.446$ ; $p = 0.066$			$\chi^2 = 7.543$ ; $p = 0.023$		

Source: own study  
F- female; M-male, T- total

Next, the highest average values of total energy expenditure among men and women were reported among students at MU, followed by UBI and BUT students. In relation to total activity, statistically significant differences were observed between the compared pairs of student group, BUT-Portuguese and BUT-MU ( $p < 0.05$ ). Table 3 presents the total energy expenditure of the examined people, including gender and statistical significance.

In relation to intensive physical activity, both men and women studying at BUT had the lowest average energy

**Table 3.** Total physical activity of MU, BUT and UBI students by gender [MET-minutes/week]

MU					
Physical activity	M	Me	SD	Min	Max
Total	M 5368.63	4565.00	3638.54	504.00	13038.00
	F 3600.79	3141.50	2270.89	528.00	11838.00
	Total 4091.86	3346.00	2816.39	504.00	13038.00
BUT					
Physical activity	M	Me	SD	Min	Max
Total	M 2399.99	1399.50	2591.74	0.00	14691.00
	F 2725.78	1826.25	2523.58	230.00	11172.00
	Total 2549.08	1670.25	2555.06	0.00	14691.00
Portugal					
Physical activity	M	Me	SD	Min	Max
Total	M 3963.32	3399.75	2984.54	0.00	14796.00
	F 3237.15	2556.00	2768.63	0.00	14262.00
	Total 3619.09	2862.00	2904.56	0.00	14796.00
Total physical activity H Kruskal-Wallis test					
Pair comparisons	Test statistics	Standard error	Significance adjusted		
BUT-Portugal	-112.037	23.949	<0.001		
BUT-MU	165.451	31.657	<0.001		
Portugal-MU	53.413	24.858	0.095		

Source: own study.  
M – male; F-female.  
M – mean; Me – median; SD– standard deviation; Min- minimum; Max- maximum

expenditure compared to women and men studying at UBI in Portugal and MU in Poland (Tab. 4). Considering the intensive activity, statistically, significant differences were

**Table 4.** Differences in intensive physical activity of Polish MU and BUT students, and Portuguese UBI students by gender [MET-minutes / week]

MU					
Physical activity	M	Me	SD	Min	Max
Intensive	M 2113.33	1440.00	2009.52	0.00	6000.00
	F 1240.00	960.00	1275.50	0.00	5760.00
	Total 1482.59	960.00	1555.52	0.00	6000.00
BUT					
Physical activity	M	Me	SD	Min	Max
Intensive	M 970.88	320.00	1946.09	0.00	12000.00
	F 828.74	360.00	1167.57	0.00	4800.00
	Total 905.83	360.00	1631.53	0.00	12000.00
Portugal					
Physical activity	M	Me	SD	Min	Max
Intensive	M 1780.69	1440.00	1904.47	0.00	13800.00
	F 1211.42	720.00	1501.40	0.00	9600.00
	Total 1510.83	960.00	1747.08	0.00	13800.00
Intensive physical activity H Kruskal-Wallis test					
Pair comparisons	Test statistics	Standard error	Significance adjusted		
BUT-Portugal	-102.478	23.625	<0.001		
BUT-MU	111.544	31.228	0.001		
Portugal-MU	9.066	24.521	1.000		

Source: own study.  
M – male; F-female  
M – mean; Me – median; SD– standard deviation; Min- minimum; Max- maximum

observed between the compared pairs of BUT– Portuguese and BUT– MU students ( $p < 0.05$ ).

Women studying at BUT had the highest values of energy

**Table 5.** Differences in moderate physical activity of Polish MU and BUT students, and Portuguese UBI students by gender [MET-minutes / week]

MU						
Physical activity		M	Me	SD	Min	Max
Moderate	M	1382.00	960.00	1440.21	0.00	5040.00
	F	687.95	240.00	996.84	0.00	4800.00
	Total	880.74	480.00	1172.52	0.00	5040.00
BUT						
Physical activity		M	Me	SD	Min	Max
Moderate	M	429.06	220.00	609.00	0.00	2880.00
	F	711.48	440.00	952.37	0.00	4320.00
	Total	558.31	360.00	794.07	0.00	4320.00
Portugal						
Physical activity		M	Me	SD	Min	Max
Moderate	M	841.80	480.00	1204.45	0.00	8784.00
	F	671.10	360.00	1026.61	0.00	7200.00
	Total	760.88	360.00	1125.97	0.00	8784.00

H Kruskal–Wallis test

Physical activity	MU	BUT	Portugal	H	p
Average rank					
Moderate	434.74	369.18	416.35	5.138	0.077

Source: own study.

M-male; F-female

M – mean; Me – median; SD– standard deviation; Min- minimum; Max- maximum.

**Table 6.** Differences in physical activity related to the walking of Polish MU and BUT students, and Portuguese UBI students by gender [MET-minuets / week]

MU						
Physical activity		M	Me	SD	Min	Max
Walking	M	1873.30	1386.00	1263.89	0.00	4158.00
	F	1672.85	1386.00	1237.11	0.00	4158.00
	Total	1728.53	1386.00	1241.95	0.00	4158.00
BUT						
Physical activity		M	Me	SD	Min	Max
Walking	M	1000.05	594.00	1332.36	0.00	5544.00
	F	1185.56	693.00	1316.65	0.00	6930.00
	Total	1084.94	660.00	1322.79	0.00	6930.00
Portugal						
Physical activity		M	Me	SD	Min	Max
Walking	M	1340.84	792.00	1507.85	0.00	11088.00
	F	1354.63	742.50	1664.42	0.00	11088.00
	Total	1347.38	792.00	1582.67	0.00	11088.00

H Kruskal–Wallis test

Pair comparisons	Test statistics	Standard error	Significance adjusted
BUT–Portugal	–50,544	23,937	0,104
BUT–MU	170,657	31,641	<0,001
Portugal–MU	120,112	24,845	<0,001

Source: own study.

M-male; F-female

M – mean; Me – median; SD– standard deviation; Min- minimum; Max- maximum.

**Table 7.** Average sitting time of students during one working day [min] (n = 823)

Sitting		M	Me	SD	Min	Max
MU	M	349.00	330.00	273.08	0.00	1200.00
	F	261.41	300.00	211.67	0.00	720.00
	Total	287.74	300.00	232.40	0.00	1200.00
BUT	M	381.09	420.00	150.91	30.00	600.00
	F	340.56	360.00	140.42	60.00	660.00
	Total	362.54	370.00	146.99	30.00	660.00
Portugal	M	391.40	360.00	164.96	30.00	900.00
	F	395.32	360.00	169.83	0.00	1020.00
	Total	393.26	360.00	167.15	0.00	1020.00

H Kruskal–Wallis test

Pair comparisons	Test statistics	Standard error	Significance adjusted
BUT–Portugal	–97.511	31.445	0.006
BUT–MU	–121.002	24.694	<0.001
Portugal–MU	–23.490	23.792	0.970

Source: own study.

M – male; F – female.

M – mean; Me – median; SD– standard deviation; Min- minimum; Max- maximum.

expenditure related to moderate activity compared to women studying at MU and in Portugal (Tab. 5). In the male group, the highest average values of the same activity were recorded among MU students, followed by Portuguese UBI students and Polish BUT students. The differences were not statistically significant ( $p > 0.05$ ).

In terms of walking-related activity, the lowest average values of weekly energy expenditure were recorded, both for men and women, among BUT students. Subsequently, the highest average values of the same activity were recorded in the group of men and women studying at MU. Without taking into account the gender of the respondents, statistically significant differences were observed between the compared pairs of the Polish MU – BUT students, and Portuguese UBI – MU students ( $p < 0.05$ ) with regard to physical activity related to walking. The students at MU obtained the highest average results of energy consumption compared to Portuguese UBI students and BUT (Tab. 6).

Both male and female Portuguese UBI students spent most of their time sitting during one working day, compared to MU and BUT (Tab. 7). Apart from the gender of the respondents, statistically significant differences were noted between the compared pairs of Polish MU-BUT and Portuguese UBI – Polish MU student groups ( $p < 0.05$ )

## DISCUSSION

The conducted research indicates that the lowest average values of energy expenditure for both women and men studying at the Polish MU and BUT and the Portuguese UBI concerned moderate physical activity. Recent studies demonstrated that the lowest values of average activity related to moderate effort [33].

Based on own study, it has been shown that the most common form of activity in the group of women studying at the Polish MU and BUT, and in the Portuguese UBI was a walking-related activity; the next most frequently chosen

type of effort was intensive effort and moderate effort. Among men studying at MU in Poland and UBI in Portugal, the highest average values of energy expenditure concerned intensive activity, followed by walking effort and moderate effort. Similar results were obtained by Bednarek et al. [34] who carried out a study on students of the Faculty of Tourism and Leisure at the University of Physical Education in Kraków, Poland, and the Adnan Menderes University in Aydin, Turkey. The highest values of the average activity of women studying in Kraków and Aydin concerned walking effort, followed by intensive activity and moderate activity. As in the case of men studying at the MU in Poland and in UBI in Portugal, students from Kraków and Aydin preferred intensive effort, followed by walking-related and moderate activity.

Garcia Puello et al. conducted a study to assess the level of physical activity of students from six universities in Barranquilla, Colombia [35]. Similar to the case of men studying at the MU in Poland and in UBI Portugal, the highest average values of energy expenditure were for intensive activity, followed by walking effort and moderate effort.

The results of the current study are consistent with the results of a study carried out by Baj-Korpak et al. [36] who analyzed the level of physical activity of students of physical education at the University of Physical Education (AWF) in Kraków. The highest average values of energy consumption were among men studying at the University of Physical Education, and similar to men studying at the Polish MU and Portuguese UBI, and concerned intensive activity, followed by walking effort and moderate effort.

The predominant level of activity of both men and women studying at the Polish MU and the Portuguese UBI was high. This pattern also persisted in the study by Vašíčková et al. who evaluated the level of physical activity of Czech pupils and students [37]. The dominant level of activity in this group, as in the case of students of the Polish MU and Portuguese UBI students, was high. The least numerous group of students from the Czech Republic, as in the case of students from the MU and UBI, consisted of students characterized by insufficient activity level.

Rajappan et al. conducted a study to determine the diversity of physical activity among students of the Asia Metropolitan University (AMU) in Chavas (Selangor), Malaysia [38]. Similar to the case of students at the MU in Poland and UBI in Portugal, the dominant level of activity in this group was high, followed by a sufficient level and non-performance of physical activity. The above-mentioned authors did not note any of the AMU students being characterized by an insufficient level of physical activity.

A study using the short version of the IPAQ questionnaire was also conducted by Chiang et al. [39], which involved students from universities Taiwanese students was at a sufficient level, followed by a high level and an insufficient level among the surveyed students. In relation to people studying at American universities, as in the case of people studying at the MU in Poland and UBI in Portugal, the dominant level of activity was high, followed by excessive and insufficient.

An assessment of the level of physical activity was also carried out by Piątkowska [40]. In that study, similar to the case of the Polish MU and UBI Portuguese students, both men and women, the dominant type of activity was at a high level, followed by sufficient and insufficient values.

The current study shows that a higher percentage of men than women studying at MU and BUT had a high or insufficient level of physical activity. In the context of the sufficient level, women studying at MU and BUT constituted a bigger group than men. The results of own research are consistent with those of Bergier et al. who evaluated the level of physical activity of Polish pupils and students [41]. As in the case of MU and BUT students, a higher or insufficient level was characteristic by a larger percentage of men than women. In the context of the moderate level, as in the case of MU and BUT students, women constituted a larger group compared to men.

The predominant type of activity in the group of women studying at the MU in Poland and UBI in Portugal was on a high level. These results are in accordance with those obtained by Kaiser and Sokołowski who examined women studying at the General Academy of Land Forces (AWL) in Wrocław and Poznań, Poland [42]. Additionally, as in the case of women studying at the MU and UBI, the highest percentage of female AWL students, in Wrocław and Poznań combined, concerned a high level of activity.

The results of the current study are consistent with the research of Morales Quispe et al. who examined third and fourth grade high school students in the Callao region of Peru. As in the case of women studying at MU and UBI, the highest percentage of female students was in high activity.

Particular interest centres on the time spent in sitting. Based on the presented study, it was found that the average sitting time during one working day was the highest in the group of Portuguese UBI students, followed by the Polish BUT and MU students. Students from UBI and BUT achieved higher results compared to those examined by Piątkowska [40]. Bergier and Ignatjeva analyzed the physical activity of students attending Polish schools in Riga, Latvia [44]. Similar to the case of women studying at MU and BUT, a lower average values of time spent on sitting was observed for girls than boys studying in Latvia.

Bergier et al. [45] also conducted research using the short version of the IPAQ questionnaire. The level of physical activity was evaluated for students of the State Higher Education School (PSW) in Biała Podlaska, Poland. Men studying in Biała Podlaska, the same as in the case of men studying at MU and BUT, were characterized by a higher average value of time spent sitting, compared to women.

## CONCLUSIONS

1. Students of the Medical University (MU), as well as Portuguese students (UBI), were characterized by a high level of physical activity, while students of the Białystok University of Technology (BUT) had an adequate level of physical activity.
2. Among women studying at MU and BUT in Poland, and at UBI in Portugal, the highest average energy expenditure values were related to walking effort.
3. Among both men and women studying at MU, BUT and UBI, the lowest average values of energy consumption were for moderate activity.
4. MU students spent less time sitting during one working day than BUT and UBI students.
5. Due to the cross-cultural nature of the study, the association between physical activity (PA) and gender cannot be precisely determined.

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