

# Level of physical activity of physical education students according to criteria of the IPAQ questionnaire and the recommendation of WHO experts

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## Summary

*Study aim:* Systematic physical activity is an effective preventive measure that supports the preservation of physical health and psychological health. Three expressions employed that relate to the work carried out with MET-min/week as a measure of the level of total physical activity are intense activity, moderate activity, and walking. These were applied to students studying Physical Education. In the process, those who failed to meet the requirements for the ‘sufficient’ level according to IPAQ criteria and as recommended by the WHO were identified.

*Material and methods:* Research was conducted amongst 146 students: 50 from Charles University (CU) and 96 from the University of Physical Education in Warsaw (UPE). The total physical activity of students was determined according to the accepted standards (IPAQ). WHO recommendations concerning physical activity per week were converted into MET-min/week used by IPAQ as follows: physical activity needs to achieve at least 1200 MET-min/week to increase its effect on health.

*Results:* The study of Physical Education students at CU shows that they were significantly more active than their counterparts at UPE. Total physical activity per week as measured by IPAQ at CU was  $9525.2 \pm 4275.9$  for men and  $10964.3 \pm 4092.0$  MET-min/week for women. At UPE, this was  $4034.3 \pm 2617.8$  for men and  $2469.8 \pm 1721.2$  MET-min/week for women. The difference in total levels of physical activity carried out by these students was found to depend largely upon their involvement in championship sports. Inclusion of WHO recommendations in the assessment of physical activity of students increased the proportion of individuals with low activity levels, particularly in the group of not-training students.

*Conclusions:* It is recommended either that the WHO criterion “of activity level for health” be added to the IPAQ classification, thus toughening the requirements of the moderate level of activity, or, alternatively, an additional threshold of completing at least 1200 MET-min/week be applied, with the recommendation that this is achieved on a regular basis.

**Keywords:** IPAQ – Recommendations WHO – Physical activity – Students

## Introduction

The World Health Organization (WHO) reports that at least 60% of the world’s population fails to comply with WHO requirements for recommended physical activity, thus leading to a sedentary lifestyle. This is one of the important risk factors in ischaemic heart disease, excessive weight, and obesity [15]. The fact that physical activity brings health benefits beyond the physiological aspect is indisputable; it also plays meaningful roles in the counteraction of depression, in the promotion of a sense of well-being, and in the appreciation of a favourable self-worth. A preventive effect of physical activity has also been confirmed in the onset of some cancers. Lagerros examinations [6] showed

that physically active women have a 20–30% smaller risk of the appearance of breast cancer than do physically passive women. A report by Lee [7] demonstrated that regular physical exercise could reduce the risk of falling ill with colorectal cancer by as much as 40–50%. Further beneficial effects of exercise have been found to include lowering the risk of the appearance of prostate cancer [13], of body of the uterus [11], and onset of lung cancer [8].

Scientists examining health effects of physical activity attempt to determine separately what level of physical activity is needed for a growing person, the level that is appropriate for an adult, and the level needed for individuals reaching old age. The goal is always to achieve the aforementioned preventive benefits. In 2010, the World Health Organization published recommendations for the level of physical activity desirable for particular age groups [14].

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For aircrew aged between 18–64 years old, it was recommended that exercise of moderate intensity should be conducted for at least 150 minutes per week or, alternatively, intense exercise (leading to a strong heartbeat, deep breathing, and precipitated action) was recommended for a minimum of 75 minutes per week, or any possible combination of these two levels of exercise, with the provision that on a one-off basis any exercise should continue for a minimum of 10 minutes. In addition, adults should also perform at least twice a week exercise that strengthens the largest muscle groups. Aiming to increase the health effect of physical activity, it was recently suggested that the run time of exercises of moderate intensity be advanced to 300 minutes per week and exercises of intense intensity be increased to 150 minutes per week. Benefits of these recommendations concerning physical activity (both the indicated length and the intensity level) include improvements in muscle activity, respiration, and blood circulation plus the preventive effect of reducing the risk of falling ill with non-infectious chronic illnesses and depression [14].

An alternative, quantifiable way of expressing the level of the physical activity – more and more applied in comparing different populations – is the IPAQ test [18]. Within an activity offered for classification, any combination of exercises having different intensity levels that average 600 MET-min/week determines a moderate level of physical activity for a given person, with the provision that if any individual exercise reaches 3000 MET-min/week, this will definitely indicate a high level. This high level of physical activity also occurs when an exercise session is initiated at least three times per week, thus ranking the individual among the group of people who conduct at least 1500 MET-min/week in the area of intensive exercise. Classification of physical activity using the IPAQ test not only measures exercise length and intensity, but also that very important component of any activity: frequency. When this is taken into account, it should amount to between three to seven times per week [2].

Monitoring of the level of physical activity, as determined by the MET-min/week measure along with the International Questionnaire of physical activity, has been used in international comparisons [1, 4, 17], in the populations of

Egypt [5], and the populations in the Czech Republic [16]. In Poland, research was carried out using the IPAQ application in the all-Polish monitoring of the level of physical activity of the entire population [10], as well as when dividing the population into students and others [9, 12]. Unification of the test procedure for IPAQ would create excellent opportunities for running comparative analyses of the level of physical activity across different populations, with the test procedure employed matching the data in the sense of accurate input [18]. This standardized IPAQ tool, with which the level of physical activity could be more frequently measured and with which comparisons would be made, is recommended in order to modify existing classifications, thus implementing tougher criteria for the moderate activity level as recommended by the World Health Organization [14]. Applying this method would allow for the identification of endangered social groups, enabling it to be used effectively when operating in the area of the prevention of many non-infectious illnesses, as well as its present use of measuring the activity level in referential groups of physically active individuals.

The purpose of this work with MET-min/week was to measure the total physical activity (along with its three categories: vigorous intensity, moderate intensity, and walking) of students studying physical education. In the process, individuals were identified who did not meet the requirements both for the moderate level in IPAQ classification [18] and according to the recommendation of experts of the World Health Organization [14].

## Material and methods

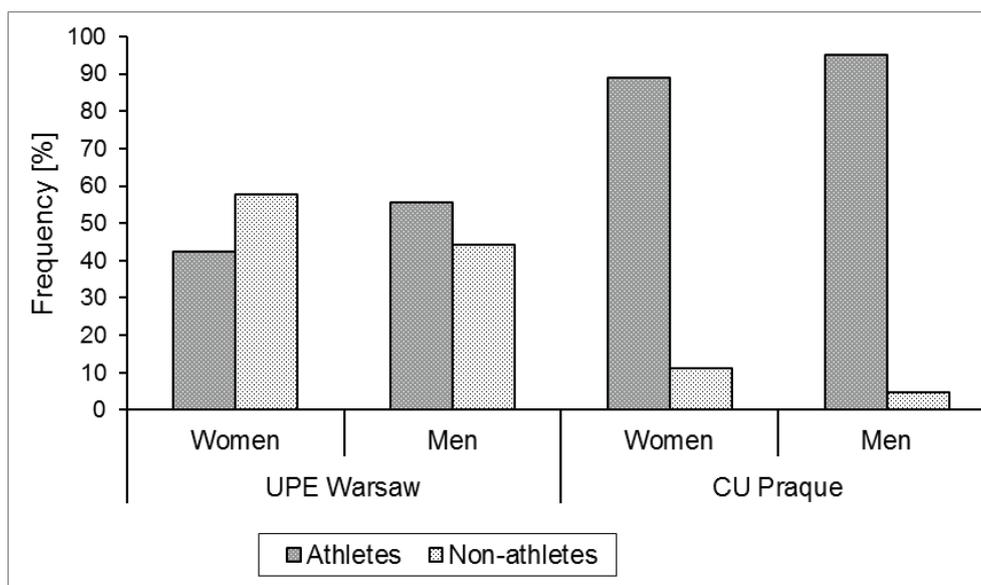
The research was conducted with a group of 146 individuals, all of them in their second year of studying physical education. Of those examined, 33 women and 63 men were at the University of Physical Education in Warsaw (UPE), while 18 women and 32 men were at Charles University in Prague (CU).

Putting together the basic anthropometric features of the students from each college demonstrated that those examined from both colleges were similar in somatic basic features as well as in the proportion of height to mass (see Table 1).

**Table 1.** Somatic characteristics of the groups tested

|                          | UPE<br>Women (n = 33) | CU<br>Women (n = 18) | UPE<br>Men (n = 63) | CU<br>Men (n = 32) |
|--------------------------|-----------------------|----------------------|---------------------|--------------------|
| Age [years]              | 20.3 ± 1.6            | 20.8 ± 1.8           | 20.4 ± 0.8          | 20.6 ± 1.2         |
| Height [cm]              | 168.2 ± 7.8           | 169.9 ± 5.9          | 181.8 ± 6.3         | 179.8 ± 6.8        |
| Mass [kg]                | 62.3 ± 7.0            | 63.1 ± 5.5           | 78.9 ± 8.9          | 76.4 ± 7.5         |
| BMI [kg/m <sup>2</sup> ] | 22.1 ± 2.0            | 21.9 ± 1.8           | 24.0 ± 2.2          | 23.6 ± 1.9         |

Legend: University of Physical Education in Warsaw (UPE), Charles University in Prague (CU)



**Figure 1.** Characteristics of the sports activity examined

However, the universities did differ in fractions of training and not-training students (see Figure 1).

Among the students examined in the Czech population, 88.9% of the women and 95.2% of the men were active competitors (mainly of team games), whilst of the Polish students, only 42.4% of the women and 55.6% of the men were in training (see Figure 1).

For determining the activity level in the examined group of students, an International Questionnaire of physical activity was applied (IPAQ, brief version). Information concerning the activity was collected in November and March, according to recommended methodology. The activity level of students was compared with MET-min/week measure in the IPAQ classification [18] and according to the WHO recommendations [14]. WHO recommendations were followed concerning the length and intensity of exercises for increasing its effect on health. Physical activity was converted into metabolic equivalents for the performed work MET, according to the conversion factors applied in IPAQ [18]:

– 300 minutes  $\times$  4.0 (conversion factor for moderate efforts) = 1200 MET-min/week

– 150 minutes  $\times$  8.0 (conversion factor for intensive efforts) = 1200 MET-min/week

Physical activity per week recommended by WHO is regarded as the completion of exercises at the level of at least 1200 MET-min/week. Statistical analysis of results was achieved using ANOVA through Statistica software (v. 9.0, StatSoft).

## Results

Analysis of the results concerning the physical activity presented in Table 2 showed that both female and male students of Charles University achieved a far higher level of physical activity carried out during the week than their peers at the University of Physical Education in Warsaw. The male students at Charles University characteristically

**Table 2.** MET-min/week is average carried out by male and by female Physical Education students for a week's total physical activity

|                      |              | UPE             | CU                | UPE             | CU               |
|----------------------|--------------|-----------------|-------------------|-----------------|------------------|
|                      |              | Women (n = 33)  | Women (n = 18)    | Men (n = 63)    | Men (n = 32)     |
| Total                | MET-min/week | 2470 $\pm$ 1721 | 10964 $\pm$ 4092* | 4034 $\pm$ 2618 | 9525 $\pm$ 4276* |
| Vigorous – intensity | MET-min/week | 1436 $\pm$ 1736 | 8149 $\pm$ 3275*  | 1998 $\pm$ 1680 | 6835 $\pm$ 3769* |
| Moderate – intensity | MET-min/week | 526 $\pm$ 462   | 1862 $\pm$ 1364*  | 1152 $\pm$ 848  | 1398 $\pm$ 1023  |
| Walking              | MET-min/week | 507 $\pm$ 478   | 953 $\pm$ 817     | 884 $\pm$ 834   | 1293 $\pm$ 934   |

Legend: University of Physical Education in Warsaw (UPE), Charles University in Prague (CU); \* – significantly different than UPE,  $p < 0.05$

achieved a greater value (about 5490.9 MET-min/week) of total physical activity compared with that achieved by those at the University of Physical Education. Female students at the Czech college also achieved more during the week (on average about 8494.5 MET-min/week) than was achieved by their peers in Warsaw (see Table 2). Students at Charles University performed far more intensive exercise during the week's physical activity in comparison with students at the University of Physical Education. The means determined by the MET-min/week measure relating to intense activity were higher for both men and for women at the Czech university compared to those at the college in Warsaw. In the case of men, the difference was 79 712.9 MET-min/week; for women, 4837 MET-min/week. In both cases, the benefit went to the Czech population (see Table 2).

Women at Charles University exercised in a much more restrained manner. However, when making comparisons based on exercising at a moderate level, the difference for women was 1336 MET-min/week to the benefit of women at CU. At UPE, male students failed to specify moderate activity in a valid statistical manner, but as measured the average was about 245 MET-min/week greater for students in Prague (see Table 2).

Neither the Physical Education students at Charles University nor those at the University of Physical Education specified their walking activity in a valid way statistically. However, their measurements did show that women at CU achieved about 445.4 and men about 408.6 MET-min/week more exercising in walking than did the students at UPE (see Table 2).

Correlation with training was confirmed that indicated that those students who were active in some sports activity achieved greater total physical activity, as determined by their MET-min/week measure. The greatest and statistically most important differences among examined groups occurred in exercises of the vigorous capacity (see Table 2).

Based on information obtained concerning the intensity and frequency of physical activity carried out by individuals over a period of 7 days, students were identified as high, moderate, or low level in the IPAQ classification. None of the female Physical Education students at either college were found to have a low level of physical activity. The moderate level was identified for the majority of students from UPE (69.7%); only 11.1% of women at CU were found to be at that level. Most of the studied female Czechs were in fact found to have a high level of physical activity (88.9%); at the university in Warsaw, less than one-third of those examined (30.3%) were at this level.

Application of the criteria recommended by the WHO (at least 1200 MET-min/week) for the moderate activity level reduced the proportion of physically active women, particularly at UPE. In total, 48.5% of female students from

UPE were found to have the high level of physical activity; 88.8% female students from CU indicated this high level. A total of 30.3% of the female UPE students, as compared to 5.6% of the CU students, fell into the moderate level of physical activity. A low level of physical activity was identified for 5.6% of female students at CU, but for as many as one-fifth of those examined from UPE (21.2%). Special concern is noted for the latter, as the teaching program at UPE includes a compulsory physical class for those studying physical education for the woman.

The above comparisons in accepted rankings of the physical activity were also applied in the category of men (see Table 3).

**Table 3.** The percentage breakdown of male Physical Education students at UPE and CU into a high, moderate or low level of physical activity, according to IPAQ classification, and according to criteria recommended by WHO

|          | IPAQ classification |       | Criteria recommended by WHO |       |
|----------|---------------------|-------|-----------------------------|-------|
|          | UPE                 | CU    | UPE                         | CU    |
| High     | 54.0                | 95.2% | 54.0                        | 95.2% |
| Moderate | 42.8                | 2.4%  | 39.7                        | 2.4%  |
| Low      | 3.2                 | 2.4%  | 6.3                         | 2.4%  |

Legend: University of Physical Education in Warsaw (UPE), Charles University in Prague (CU)

Over one-half of the male students from UPE (54.0%) were found to have the high level of physical activity, while almost all the male students from CU (95.2%) indicated this high level. A total of 42.8% of students at UPE, though only 2.4% of students at CU, fell into the moderate level of physical activity. Unlike women, some men at both colleges (3.2% from UPE and the 2.4% from CU) were found not to meet the requirements for the moderate level of physical activity in the IPAQ classification (see Table 3). After the application of the criteria recommended by WHO (at least 1200 MET-min/week), double the percentage of men from the Warsaw college recorded a low level of physical activity; the percentage of such students didn't change at the Czech college (see Table 3).

## Discussion

In the report drawn up by the WHO in 2010 [14], recommendations were presented in the area of physical activity for improvement in the effect on health. These recommendations involve the realization of 300 minutes per week of moderate exercise, or 150 minutes of intense exercise, with a minimum one-off duration of at least 10 minutes. The minimum physical activity recommended to

be achieved in this fashion per week is of at least 1200 MET-min/week, which should result in benefits in muscle activity, respiration, and blood circulation, plus the reduced risk of falling ill with non-infectious chronic illnesses and depression [14]. However, going back into IPAQ history, we find that the classification proposed here in fact arose much earlier. Alterations to the questionnaire in 1998 lasted only for a year, when changes were suggested in both the long and brief versions [3,4], and in 2005, when the IPAQ scientific committee published principles on how to use the questionnaire and how the data should be handled. Classification of the activity in IPAQ for the moderate level has been equated to achievement of exercise at a level of at least 600 MET-min/week, putting special pressure on the frequency of doing exercise [18].

Recognising the undoubted advantage of using the International Questionnaire of physical activity (IPAQ), a careful construction by its authors, following rigorous rules, enables comparisons to be made among different populations. The questionnaire is adapted to conditions of a given country and takes into account the specificity of the lifestyle of the residents [4]. Following the terminological and notional uniformity of different language versions [18], as well as the standardization of this tool for the evaluation of physical activity, a questionnaire is created which is particularly recommended for the identification of groups below the 'sufficient' level, something which increases the risk of the appearance in future of new health disorders. Any influence that WHO recommendations concerning physical activity may have on the governing classification, therefore, can be reflected in IPAQ, by providing an additional threshold for the completion of exercise at the level of at least 1200 MET min/week or of toughening requirements for the moderate level in which 600 MET min/week is applicable.

This diagnosis conducted by us into the level of physical activity of students of direction has demonstrated to physical education how, when considering the insufficient activity level, it is possible to single out a whole range of categories of individual in assessed populations, merely by accepting the IPAQ ranking and considering WHO recommendations. The individuals in this study were a population of physically active students in a teaching program that carried out compulsory fitness classes, and differences in the level of activity were shown to depend largely on the commitment to training associated with a sports activity. Of the examined students at Charles University, 90% were competitors in different sports disciplines. These students exercised on average at the level 10964.3 and 9525.2 MET-min/week respectively, for categories of women and men. Such high average measures of activity per week recorded for training students have been confirmed in the examination of Physical Education students at the University in Poznań [12]. Here, those that not only carried out active

individual sports, but also sportingly trained competitors, achieved a total of 8001 to 12000 MET-min/week, whilst individuals only practicing team games achieved from 6001 to 8000 MET-min/week. Students not training for any sport exercised far less, achieving about 2000 MET-min/week, with only an occasional case in the range of 6000 to 10000 MET – min/week.

The above measures of activity confirm results achieved by us in the population of students from the college in Warsaw. Due to the fact that in this group the majority of not-training individuals were women – only 42.4 % were active competitors – their physical activity amounted to an average of 2469.8 MET-min/week, which is much less than recorded for the largely training group of female Czechs.

A comparison of the level of physical activity among university students was also conducted for groups of students within the humanities at the University in Beijing and at the University in Olomouc [17]. The total mean of physical activity in the group studying in the Czech Republic was 6456 MET-min/week for men and 5296 for women. Characteristically in China, the averages for students were, as categorised by sex, only 2843 and 1982 MET-min/week. Comparing averages with results of our work points to certain analogies: a study of similar subjects at different colleges make populations appear to be different only when measuring the level of physical activity done per week. Thus, it is important that lead diagnoses of this type, particularly amongst young people with such a diversity of cases, select those activities that lead to an excessively low level of physical activity, where an increased risk of the appearance of non-infectious illnesses exists in the future.

The IPAQ classification applied in our examination showed that, in the case of the moderate level of physical activity, only men failed to meet the requirements: 3.2 % at UPE and 2.4% at CU. However, similar cases weren't apparent, either in the group of women from the college in Warsaw, or amongst the Physical Education students examined at Sokołowski in Poznań [12]. A similar diagnosis with the IPAQ application was conducted amongst students of humanistic disciplines. Analysis of physical activity amongst 123 students and 135 students at the Silesian University found only 2.44% of women and 1.48% of men who had an insufficient level of physical activity [9]. At the moderate activity level, this analysis failed to meet with the requirements, as it was with 6.2% of the women and 5.5% of the men studying at the University in Olomouc and for the 19.0% of the women and 12.0% of the men at the University in Beijing [17]. In a nationwide examination conducted among 2400 students from randomly chosen universities in the Czech Republic, the low activity level was identified for only 5.8% of those examined [16].

Such little interest by individuals concerning insufficient levels of physical activity in examined populations of students can, of course, lead to optimistic conclusions about the physical fitness of the young population. However, such small fractions of individuals with insufficient exercise in examined populations can alternatively be the result of setting a criterion too low, as was demonstrated in the IPAQ by setting the moderate level of physical activity at a minimum of 600 MET – min/week.

Implementing the sharper criterion, as recommended to the World Health Organization by experts in our examination, the fraction of individuals at or below the low activity level increased to 21.2% of women and 6.3% of men at the University of Physical Education and up to 5.6% of women at Charles University. However, applying this classification failed to change the percentage of men (2.4%) identified at or below the too low activity level at the Czech college.

## Conclusions

1. The greater level of physical activity found among Physical Education students at Charles University in Prague compared with those at the University of Physical Education in Warsaw was found largely to depend upon their involvement in championship sports.
2. The diagnosis conducted by us demonstrated to physical education how, when at or below the low activity level, it is possible to identify and separate part of the assessed population merely by accepting the IPAQ ranking and considering the WHO recommendations.
3. Application of WHO recommendations would lead to the implementation of the requirement of 1200 MET-min/week to the moderate level of physical activity in the IPAQ questionnaire, increasing the identification of individuals at or below the moderate activity level, particularly among people not in training.
4. It is recommended for health reasons that the recent tendency to remove WHO recommendations from the IPAQ governing regulations be reversed. This would lead to either a toughening of requirements for the moderate level of physical activity or application of an additional threshold requiring completion of exercises of at least 1200 MET-min/week, with an attendant recommendation as to the regularity of completing them.

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**Received 14.10.2013**

**Accepted 12.02.2014**

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**Acknowledgements**

This work was performed as part of a research project on the Józef Piłsudski University of Physical Education in Warsaw, project number BW133, financed by the Ministry of Science and Higher Education.