

Level and determinants of physical activity among school adolescents in Poland

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Bergier B, Bergier J, Paprzycki P. Level and determinants of physical activity among school adolescents in Poland. *Ann Agric Environ Med.* 2014; 21(1): 75–78.

Abstract

The recognition of adolescents' physical activity has become one of the serious challenges of the modern times, as a concern about the future health of societies. The major goal of the presented study was to discover the level of physical activity among Polish adolescents aged 16–18, and the factors which condition this level. The investigations were carried out in 2011, among 2,974 school adolescents from various locations in Poland – 1,790 girls (60.2%), and 1,184 boys (39.8%). As a study method, a short version of the IPAQ was applied. The results of the study indicated that a larger number of girls than boys show a low level of physical activity. With respect to activity among boys, higher values of intensive and moderate efforts are noted, while in girls, higher values of activities related to walking. It was confirmed that the level of physical activity does not depend on the place of residence. However, the number of physical exercise classes attended is a significant factor, both among boys and girls. It was also found that adolescents who more frequently lead a sedentary style of life are characterized by a lower level of total physical activity. Sedentary lifestyle (time spent sitting) does not differ among the level of physical activity of girls and of boys, neither with respect to the scope of the total physical activity nor to its three levels (low, moderate, high).

Key words

School adolescents, physical activity, determinants of physical activity

INTRODUCTION

The level of physical activity among school adolescents is an important premise for their present and future health-promoting life style. The importance of this problem is especially emphasized in reports published in recent years on various continents [1, 2, 3, 4]. The development of a new instrument – the International Physical Activity Questionnaire (IPAQ) – designed for a wide population of respondents aged from 15–69 [5, 6], provided an opportunity to compare the physical activity of various social and occupational groups, and also – which is especially important – within individual countries. In order to compare the physical activity of communities from various countries it is necessary to conduct studies of the largest population possible, which justifies adopting them as a kind of objective status. Unfortunately, in Poland these studies are still scarce. The above-mentioned requirement is satisfied by an all-Polish study conducted among more than 7,000 adolescents [7], and studies of the inhabitants of the city of Warsaw [8]. The majority of Polish studies to-date are of a contributory character, due to very modest research material. The results of the presented study were compiled based on a group of 3,000 school adolescents from the entire country, aged 16–18, and present the current state of physical activity and its determinants. Literature reports emphasize the role of physical activity in the prevention of many diseases, including those especially of the cardiovascular system [9, 10, 11] and the problem of obesity [12, 13].

Investigations performed with the use of the IPAQ questionnaire by researchers from many countries occupy a special position [14, 15, 16, 17, 18, 19]. The following reports should be mentioned concerning studies evaluating physical activity among adolescents [20, 21, 22, 23, 24].

OBJECTIVE

The recognition of the level of physical activity among Polish school adolescents aged 16–18, and the factors conditioning this level. The short version of the International Physical Activity Questionnaire was used a research tool.

MATERIALS AND METHOD

The study was conducted in 2011 among school adolescents from many locations in Poland, and covered 2,974 schoolchildren – 1,790 girls (60.02%) and 1,184 boys (39.08%). The following number of schoolchildren were examined in individual age groups: age 16 – 600 girls and 507 boys, age 17 – 551 girls and 325 boys, age 18 – 639 girls and 352 boys.

Statistical analysis was performed using statistical package Statistica 10PL. Analysis of the differences was performed in two ways: with the use of raw IPAQ data, and using the IPAQ data categorized into 3 categories of activity: low level of activity (≤ 600 Meto-minutes/week), moderate level of activity (>600 and $\leq 1,500$), and high level of activity ($>1,500$).

In the case of raw IPAQ results, their distribution showed deviation from normal distribution; therefore, non-parametric tests: Mann-Whitney test (2 groups compared) or Kruskal-Wallis test (3 groups compared) were applied for analysis of significance of the differences. While investigating

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Received: 13 September 2013; accepted: 26 October 2013

the relationships between categorized variables, Pearson's chi-square test was used due a considerable size of the sample in modification of the 'highest reliability'. The significance level was set at $p_{\alpha} = 0.05$. Test values for $p < p_{\alpha}$ were considered statistically significant.

RESULTS

The physical activity of the schoolchildren in the study shows its total level with consideration of the following types of activity: intensive, moderate, walking, and 3 levels of activity.

Among factors which determine physical activity were considered: gender, place of residence, sedentary style of life, and participation in physical exercise classes.

The level of total physical activity of the schoolchildren examined expressed by arithmetic mean reached the value of 2.387 MET, with higher values observed in boys – 2,640 MET, than girls – 2,219. A dominant type of activity among both boys and girls was intensive effort and walking, whereas the smallest percentage was a moderate effort (Tab. 1).

While searching for the factor determining the level of physical activity among adolescents the results were categorized into 3 quartile ranks: a) low, b) moderate, c) high.

Table 1. Types of physical activity with consideration of gender (mean values in MET)

| Type of activity | Gender | | Total | p Man-Whitney |
|------------------|---------|---------|---------|---------------|
| | girls | boys | | |
| moderate | 485.6 | 623.8 | 540.6 | 0.0000001 |
| intensive | 557.5 | 1,092.2 | 770.4 | 0.0000001 |
| walking | 1,176.1 | 924.4 | 1,075.9 | 0.0000001 |
| total | 2,219.2 | 2,640.4 | 2,386.9 | 0.0000001 |

Physical activity and gender. The structure of total physical activity among adolescents is different in girls than boys. A larger number of girls than boys (8.6% and 6.17%, respectively) show a low level of physical activity, similar to a moderate level – 23.6% – in girls, and 17.6% – in boys. With respect to a high level of activity, boys obtained better results – 76.2%, compared with 67.8% in girls. A significant variation was observed at each level of physical activity in the structure of total activity according to gender (Tab. 2).

Also, the boys and girls in the study differed statistically by the types of physical activity. A higher level of intensive and moderate effort was found in boys than girls, whereas girls showed a higher level of physical activity with respect to walking (Tab. 1).

Table 2. Structure of level of total physical activity among adolescents (%)

| Level | Gender | | p value |
|--------------|---------|-------|---------|
| | Girls | Boys | |
| low | 8.60 | 6.17 | 0.0164 |
| moderate | 23.63 | 17.65 | 0.0001 |
| high | 67.77 | 76.18 | 0.00001 |
| p chi-square | 0.00001 | | |

Physical activity and sedentary style of life. No statistical differences were noted between the 2 genders according to the

level of adolescents' physical activity and their participation in a sedentary style of life, neither with respect to the 3 levels of activity nor the total physical activity. The mean duration of the sedentary style of life was 219.8 min., with the value 217.7 min. in boys and 221.4 min. in girls (Tab. 3).

Table 3. Level of physical activity and sedentary style of life (mean values)

| Level of activity | Mean values (min) | | | | | | p Kruskal-Wallis |
|-------------------|-------------------|-------|-----------|-------|-----------|-------|------------------|
| | Girls | | Boys | | Total | | |
| | \bar{x} | SD | \bar{x} | SD | \bar{x} | SD | |
| low | 199.8 | 244.6 | 272.5 | 266.0 | 229.2 | 252.8 | 0.4325 |
| moderate | 200.7 | 198.2 | 249.7 | 224.6 | 214.8 | 206.4 | 0.2899 |
| high | 233.6 | 211.2 | 206.8 | 183.0 | 220.3 | 197.9 | 0.3997 |
| Total | 221.4 | 210.5 | 217.7 | 196.4 | 219.8 | 204.2 | 0.2619 |
| p Kruskal-Wallis | 0.1527 | | 0.7150 | | 0.5530 | | |

Physical activity and place of residence. The total physical activity among adolescents was not conditioned by the place of residence. A higher level of activity was observed among urban adolescents, compared to those living in rural areas.

Statistically significant differences in the types of individual activities were observed according to the place of residence. Rural adolescents undertook more moderate and intensive efforts, whereas adolescents from small and larger cities undertook more walking (Tab. 4).

Table 4. Types of physical activity with consideration of place of residence (mean values in MET)

| Type of physical activity | Place of residence | | | p Kruskal-Wallis |
|---------------------------|--------------------|----------------------|----------------------|------------------|
| | rural areas | urban areas < 50,000 | urban areas > 50,000 | |
| moderate | 560.7 | 531.5 | 503.0 | 0.0425 |
| intensive | 798.5 | 726.1 | 759.2 | 0.2155 |
| walking | 984.8 | 1,174.1 | 1,171.4 | 0.00001 |
| Total | 2,344.0 | 2,431.8 | 2,433.6 | 0.1730 |

Physical activity and participation in physical exercise classes. The total activity of boys was significantly higher than that of girls in the groups of the number of physical exercise classes up to 3 hours, and from 3–5 hours. In the case of the number of PE classes above 5, these differences were statistically insignificant (Tab. 5).

In order to better recognize the participation of adolescents in physical exercise classes at each level of physical activity, an analysis was performed with consideration of intensive, moderate effort and walking. With respect to intensive physical activity, boys obtained considerably higher values (statistically significant) in each group of the number of hours of PE classes. The greatest differences were noted with respect to the participation of adolescents in more than 5 hours of PE classes (Tab. 6).

Considering moderate activity with the number of PE classes up to 5, boys were characterized by higher values, while girls obtained higher values of physical activity concerning the number of PE classes of more than 5 hours (Tab. 7).

With respect to physical activity measured by walking, girls participating in each group of the number of PE classes achieved a higher activity than boys (Tab. 8).

Table 5. Total physical activity and participation in physical exercise classes

| No. of PE classes | Physical activity measured in MET | | | | | | p Man-Whitney |
|-------------------|-----------------------------------|-------|-----------|-------|-----------|-------|---------------|
| | Girls | | Boys | | Total | | |
| | \bar{x} | SD | \bar{x} | SD | \bar{x} | SD | |
| < 3 hours. | 203.5 | 207.3 | 222.1 | 195.9 | 213.0 | 201.5 | 0.0000001 |
| 3 and 5 hours | 229.3 | 196.1 | 248.3 | 202.7 | 239.5 | 199.7 | 0.0000001 |
| > 5 hours | 219.2 | 184.6 | 156.2 | 162.6 | 175.7 | 170.6 | 0.422664 |
| p Kruskal-Wallis | 0.00001 | | 0.026132 | | 0.00001 | | |

Table 6. Intensive physical activity and participation in physical exercise classes

| No. of PE classes | Physical activity in MET | | | | | |
|-------------------|--------------------------|----------|-----------|-----------|-----------|-----------|
| | Girls | | Boys | | Total | |
| | \bar{x} | SD | \bar{x} | SD | \bar{x} | SD |
| < 3 hours | 445.9564 | 791.4202 | 1,068.761 | 1,161.012 | 676,2330 | 991.332 |
| 3 and 5 hours | 645.6946 | 932.8566 | 1,078.548 | 1,059.357 | 821.9809 | 1,008.696 |
| > 5 hours | 629.3333 | 898.0373 | 1,301.953 | 1,322.902 | 982.0488 | 1,186.217 |
| p Kruskal-Wallis | 0.00001 | | 0.3321 | | 0.00001 | |

Table 7. Moderate physical activity and participation in physical exercise classes

| No. of PE classes | Physical activity in MET | | | | | |
|-------------------|--------------------------|----------|-----------|----------|-----------|----------|
| | Girls | | Boys | | Total | |
| | \bar{x} | SD | \bar{x} | SD | \bar{x} | SD |
| < 3 hours | 423.1220 | 543.9953 | 558.8446 | 614.2828 | 473.3042 | 574.4975 |
| 3 and 5 hours | 522.3355 | 510.3672 | 663.6557 | 659.7314 | 579.8904 | 579.8662 |
| > 5 hours | 690.2051 | 768.3156 | 632.3256 | 684.4981 | 659.8537 | 723.8975 |
| p Kruskal-Wallis | 0.00001 | | 0.0113 | | 0.00001 | |

Table 8. Physical activity (walking) and participation in physical exercise classes

| No. of PE classes | Physical activity in MET | | | | | |
|-------------------|--------------------------|----------|-----------|----------|-----------|----------|
| | Girls | | Boys | | Total | |
| | \bar{x} | SD | \bar{x} | SD | \bar{x} | SD |
| < 3 hours | 1197.781 | 848.4301 | 897.5133 | 861.6787 | 1086.760 | 865.2420 |
| 3 and 5 hours | 1150.586 | 847.2088 | 963.4399 | 839.9798 | 1074.368 | 849.0008 |
| > 5 hours. | 1251.419 | 971.6866 | 785.1698 | 942.1877 | 1006.923 | 981.5762 |
| p Kruskal-Wallis | 0.3785 | | 0.0102 | | 0.1361 | |

DISCUSSION

The presented results of studies of adolescents from various locations in Poland justify their adoption as some kind of standard for the evaluation of physical activity among Polish adolescents aged 16–18. Considering clearly observed difficulties in the replies by the respondents who completed the long version of the IPAQ questionnaire, the short version of this research instrument was consciously used for the study, the advantages of which seem to be obvious [25].

It should be presumed that the results of the presented study, as well as previously obtained results [7], and studies of a large population of the inhabitants of Warsaw [8], provide an answer concerning the objective state of physical activity of adolescents in Poland. Based on these reports, it may be presumed that the total level of physical activity among Polish adolescents is several thousand MET/min./week (2,000–4,000MET), and not, as reported in some studies, even more than a dozen thousand MET/min./week. It is noteworthy that the studies of Lithuanian adolescents [24] showed a total physical activity on a level close to 5,000 MET. More than 60% of Polish adolescents are characterized by a high level of physical activity, with higher values observed in boys. In the structure of physical activity there dominates activity related with walking, and activity of an intensive type, while among boys intensive activity dominated [7].

No differences were observed according to the place of residence; therefore, it may be assumed that at present the environmental differences are equalised.

In the presented study, one more factor was considered which conditioned the level of total physical activity, i.e. the participation of schoolchildren in physical exercise classes. This is an extremely up-to-date problem, because of the commonly observed phenomenon of dismissing adolescents from physical exercise classes, especially of adolescent girls.

The results of the study showed that adolescents attending physical exercise classes up to 5 times weekly are characterized by a higher physical activity. Therefore, it may be presumed that PE classes at school, to a great degree, affect the total level of physical activity of schoolchildren, especially boys, because the physical activity of girls is lower. However, it is surprising that adolescents who attend physical exercise classes of more than 5 hours weekly are characterized by a lower total physical activity. It is probable that such a high participation in this type of class results in a lower activity associated with, e.g. household chores or activity related with movement. Therefore, attention should be paid to the fact that adolescents attending the largest number of physical exercise classes clearly dominated with respect to the values of intensive efforts.

CONCLUSIONS

Scientific investigations showed a high variation in the physical activity of girls and boys, and the factors which condition these variations.

- 1) Boys are characterized by a clearly higher level of total physical activity, compared to girls. A larger number of girls rather than boys show a low level of physical activity and lower participation in efforts of high intensity of physical activity. With respect to activity among boys, higher values of intensive and moderate efforts are observed, while in girls, higher values of activities related to walking.
- 2) Adolescents who more frequently lead a sedentary style of life are characterized by a lower level of total physical activity.
- 3) Place of residence does not condition the level of physical activity. A slightly higher level of activity is noted among schoolchildren living in urban than rural areas. Rural adolescents perform more efforts of an intensive and moderate type, while those living in small towns and large cities – with respect to walking.

4) A larger number of physical exercise classes attended conditions a higher level of physical activity, both among girls and boys. Boys who attend a larger number of physical exercise classes are characterized by a higher physical activity in intensive and moderate efforts, while girls in the area of activity associated with walking.

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