

Physical activity of female students in secondary schools from the aspect of physical activity recommendations fulfilment

Physical activity of female students

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ABSTRACT

Increasing energy intake and decreasing movement performance constitutes manifestly but mainly latently one of the greatest population issues of mankind. More experts focus on the issue, clearer can be defined the way of its elimination. The elimination consists in returning of physically active way of life. The best period to start finding and offering appropriate solutions is in childhood and continue through adolescent period. What we need are serious analyses of movement regimes of all age categories. **Purpose.** The aim of the paper was to analyse physical activity of female of selected secondary schools in Presov district region from the aspect of physical activity recommendations fulfilment. **Methods.** Research group consisted of 353 female students from 14 selected secondary schools in Presov district region. Students were distributed in four groups according to age from 15 to 18 years old. **Results.** More than a half of 15-18 years old female students did not perform movement activity of medium or high intensity. The highest percentage of success rate in criteria fulfilment

achieved female of all age categories in walking 5 times per week minimally 30 minutes (W 5x30). Only 44.3% of female at the age of 15 and up to 70.8 % at the age of 18 met at least one criterion of physical activity recommendations. **Conclusions.** From the aspect of physical activity recommendations fulfilment, the most successful criterion was performing physical activity regardless its intensity. Physical activity recommendations seem to be very hard to achieve in the age category, mainly in physical activity intensity.

Key words: Physical Activity Intensity. IPAQ. Adolescents. Health

Introduction

From the historical point of view, the mankind developed for thousands of years in relative lack of food but with the high presence of physical activity in life. It means that mankind has adapted itself on lower energy intake and higher energy output. At present time, the situation contrasts with the past and human being is not able for the first time of its history to fully eliminate drop-out of physical activity caused by changes in manufacturing process and way of life [2]. Moreover, increasing energy intake at all age levels, especially in countries with higher living standards as well as decreasing movement performance constitutes manifestly but mainly latently one of the greatest population health issues.

The positive influence of physical activity undertaken at recommended levels is associated with multiple health benefits and lowers the risk of numerous illnesses in people, irrespective of their age, gender or locality [1]. On the other hand, physical inactivity is the fourth risk factor after hypertension, smoking and high glucose levels of premature morbidity worldwide [2]. Unfortunately, in most European countries, the number of overweight and obese youth has more than doubled in the past 20 years [17]. Thus, overweight as well as obesity have been found to impair the ability of adolescents to achieve the physical activity recommendations [18].

General recommendations created by the WHO [19] reveal that physical activity undertaken by adolescents should fulfilled following criteria of type (aerobic, muscle and bone strengthening, balance improving), duration (at least 60 minutes), frequency (at least 3 times per week), intensity (from moderate to vigorous) and volume (determined by frequency and duration). Population studies demonstrate that many adolescents do not meet established recommendations for daily moderate to vigorous physical activity [20, 21, 22]. The worst is that the amount of practised physical activity is continually decreasing and in last two decades it is approximately up to 30% [2].

Recent task for science is not only to remind new generation about the issue, but also to offer solutions. The best period to start finding and offering appropriate solutions is in childhood and continue through adolescent period. The advantage of this step is the fact that apart from immediate health benefits, children and adolescents' values are created that has transferal effect to adulthood [3, 2].

Changes in the amount of practised physical activity of youth population in last twenty-five years show linear decrease. The reverse effect is recorded in increasing of youth obesity. Attendant phenomenon of this way of life is retrogressive health condition of children and adolescents, their decreasing aerobic fitness, decreased ability to regenerate after load and high risk of civilisation diseases [5].

Minimum need of human being physical activity encloses so called the threshold value. It is about inevitable amount of physical activity which is needed for healthy development of organism. The level of threshold value changes (decreases) with increasing age of individual. According to newer reduced norms it is inevitable in youth age to maintain minimal level consists of 60 minutes of organised and 60 minutes of spontaneous daily physical activity [7]. The lowest level of physical activity is from 30 to 60 minutes of medium or intensive load during day in and out of school [8]. Similar trend in recommended physical activity norms is monitored in adolescents.

Not so long ago healthy oriented physical activity was considered as such that in prevailing number of days per week female achieved energy output $9 \text{ kcal/kg.day}^{-1}$ and male $11 \text{ kcal/kg.day}^{-1}$. At present, experts more incline to physical activity recommendations in which energy output should be on value minimally $6-8 \text{ kcal/kg.day}^{-1}$ [8]. It means minimally 60 minutes from medium to high intensity per day. We recall that physical activity of medium intensity is characterised by medium effort (3-6 METS) and physical activity of high intensity is characterised by more challenging activity where energy output is increased over basal metabolism at least six times (6 METS).

Other aspects that should be taken into consideration are gender and age differences in meeting general recommendations for physical activity. Most research results confirm the lower probability of girls being physically active compared with boys [12, 13, 15, 14, 22]. Another research showed that adolescent boys met the recommendations more frequently (between 1.1 and 11.3 times) than adolescent girls [25]. Finally, the association between age and achievement of physical activity recommendations is not clear; although, age was thought to be related to a decline in physical activity [26]. It is supported with the research results [23, 19, 20] that describe declining tendency of moderate to vigorous physical activity during the

preadolescent and adolescent years. Moreover, boys are more active than girls, and these differences in level of moderate to vigorous physical activity remain constant as age increases [23, 20, 24].

More experts focus on the issue; clearer can be defined the way of its elimination. Research studies not only from sport sciences but also from social, biological and mainly medical area indicate that one of the irreplaceable ways to change positively the situation consists in recovering of physically active way of life [1]. Prior to this step, there is inevitable process of the assessment of physical activity levels in different age categories, as well as determining changes in physical activity levels [22]. Variety of applied methods for gaining the volume and intensity of physical activity in individual age categories caused problems with comparing achieved data in national as well as in international level. Consequently, there is problem to generalise recommendations.

An effort to create universal standardised method was crowned by creating short and long version of international questionnaire IPAQ (The International Physical Activity Questionnaire) [4]. The number of researches using this method in last decades enables their acceptable mutual comparability based on reliability and validity criteria. However, there is subjective evaluation of respondent during questionnaire administration and it is quite common to overestimate the physical activity undertaken, which was confirmed in earlier studies in different countries [27, 28]. Therefore, it is ideal to combine self-reported method using questionnaires [29] with device monitoring as pedometers, heart rate monitors, accelerometers or GPS [22].

With the clear defined factor, the question is what should be the minimal amount of physical activity that reveals its health benefit. What we need are serious analyses of movement regimes of all age categories. The aim of the paper was to analyse physical activity of female of selected secondary schools in Presov district region from the aspect of physical activity recommendations.

Material and Methods

The research was applied on 353 female students from selected secondary schools per stratified random sampling: secondary vocational schools, business academy and pedagogical secondary school of all 13 districts in Presov region that represents less than 3% of female secondary school population in the region. In all selected schools, we randomly chose in each year one class in which we tested each female. Female students were distributed in four groups according to age from 15 (n=97), 16 (n=86), 17 (n=105) to 18 (n=65) years old.

Physical activity volume data were diagnosed using standardised questionnaire IPAQ (International Physical Activity Questionnaire), long version was used [4]. Questionnaires were administrated online during teaching units through internet system INDARES. Administration was controlled with respect to manual and with trained person in ratio 10 students on one trained person. Questionnaires were used to gain data about the volume of physical activity performed in week in three areas: vigorous and medium physical activity and walking using continual score in MET/minutes/week.

Based on presented data we monitored physical activity recommendations fulfilment of week according to following criteria: performing of vigorous physical activity minimally three times per week in 20 minutes (V 3x20); performing medium physical activity minimally five times per week in 30 minutes (M 5x30); continual walking minimally five times per week in 30 minutes (W 5x 30) and daily physical activity in 60 minutes (Sum 7x60) [4].

Normality of research data distribution was assessed using Shapiro-Willk test. For basic statistical description of data mean (\bar{x}) from the measures of central tendency and standard error of mean (SEM) from the measures of variability was used as well as minimal and maximal value.

Significance differences of performed physical activity level were calculated between 15. and 16/17/18. years of age. We considered as priority to find out the difference between the entry and finishing of secondary school (that means the difference that shows on changes during the period of studying at secondary school). Non-parametric Kruskal-Wallis analysis of variance (K-W Anova) was used for evaluating differences between physical activity volumes of observed age groups. Mann-Whitney test with Bonferroni correction of p-value was used for multiple comparisons of mean between age groups. The rejection of the null hypothesis was assessed at the level of $p \leq 0.05$. Statistical analysis was carried out using Statistica, version 12.0 software (StatSoft, Inc.; Tulsa, USA).

.Results

Volume of physical activity

Shapiro-Willk test showed non-normality of distribution of gained data. Despite of age and residence of living homogeneity of monitored group, data were positively skewed.

As results show, more than a half of female (53.82%) at the age of 15 up to 18 years old did not perform any physical activity of high or medium intensity during monitored week. The only performed activity was walking; however, it did not apply for all female students. In

some cases, female did not fill in any continual walking that last at least 10 minutes during transferring or during spending free time in whole week.

The level of practised movement activity in female can be evaluated as considerably heterogeneous with major differences where the lowest number of MET/minutes/week spend doing physical activity was 82.5 and the highest was up to 13 783 (see Table 1). Comparably, in female research groups there is observed tendency of gradual increasing of practised physical activity level form the aspect of increasing age.

Table 1 Basic statistical characteristics of physical activity volume undertaken by 15 to 18 years old girls

<i>Age</i>	<i>Volume of physical activity</i>	<i>x</i>	<i>SEM</i>	<i>min</i>	<i>max</i>
15 years	VMET	370.8	70.4	0.0	3960.0
	MMET	1099.1	114.2	0.0	4740.0
	WMET	1414.2	170.7	0.0	3960.0
	SUMMET	2884.2	252.2	0.0	4740.0
16 years	VMET	420.0	133.6	49.5	8349.0
	MMET	1170.9	129.7	82.5	13329.0
	WMET	1835.5	172.4	0.0	7140.0
	SUMMET	3426.5	313.8	0.0	5460.0
17 years	VMET	290.9	71.1	66.0	8349.0
	MMET	868.2	81.0	196.0	13783.0
	WMET	1356.9	125.5	0.0	3960.0
	SUMMET	2516.0	176.4	0.0	5115.0
18 years	VMET	386.3	106.4	0.0	6006.0
	MMET	1620.9	277.2	90.0	9195.0
	WMET	1732.5	217.3	0.0	4140.0
	SUMMET	3739.7	513.9	0.0	13280.0

Note: x – average values, SEM – standard error of mean, min – minimum values, max – maximum values

VMET – MET/minutes/week of vigorous intensity physical activity week

MMET – MET/minutes/ week of medium intensity physical activity week

WMET – MET/minutes/week spend by walking

SUMMET – MET/minutes/week of performed physical activity

Comparing female who were in first and last studying year (15 and 18 years old female students) (see Tab. 1), higher average values were monitored in group of female who were in last year in all following criteria: in intensive physical activity (4,01%), medium physical activity (32,19%) as well as in walking (18,36%) and in total practised physical

activity (22,88%) during whole week. Presented differences in performing physical activity were not statistically significant between all age categories (see Tab.2).

Table 2 Results of statistical analysis of differences in physical activity volume in relation to age (Kruskal-Wallis analysis of variance with multiple comparisons of mean)

	K-W analysis of variance			Multiple comparisons of mean		
	H	df	Sig.	group	U	Sig.
VMET	1.957	3	0.581	15 vs. 16	1.2334	1.000
				15 vs. 17	0.9363	1.000
				15 vs. 18	0.5999	1.000
				16 vs. 17	0.3494	1.000
				16 vs. 18	0.5264	1.000
				17 vs. 18	0.2262	1.000
MMET	3.925	3	0.270	15 vs. 16	0.2847	1.000
				15 vs. 17	0.9870	1.000
				15 vs. 18	1.0219	1.000
				16 vs. 17	1.2456	1.000
				16 vs. 18	0.7401	1.000
				17 vs. 18	1.9185	0.330
WMET	7.909	3	0.048	15 vs. 16	2.4655	0.082
				15 vs. 17	0.3273	1.000
				15 vs. 18	1.5408	0.740
				16 vs. 17	2.1939	0.169
				16 vs. 18	0.7191	1.000
				17 vs. 18	1.2728	1.000
SUMMET	5.466	3	0.141	15 vs. 16	1.2820	1.000
				15 vs. 17	0.6964	1.000
				15 vs. 18	1.1734	1.000
				16 vs. 17	1.9799	0.286
				16 vs. 18	0.0109	1.000
				17 vs. 18	1.8131	0.418

H- statistical value of K-W Anova, df – degree of freedom, Sig. – signification of differences,

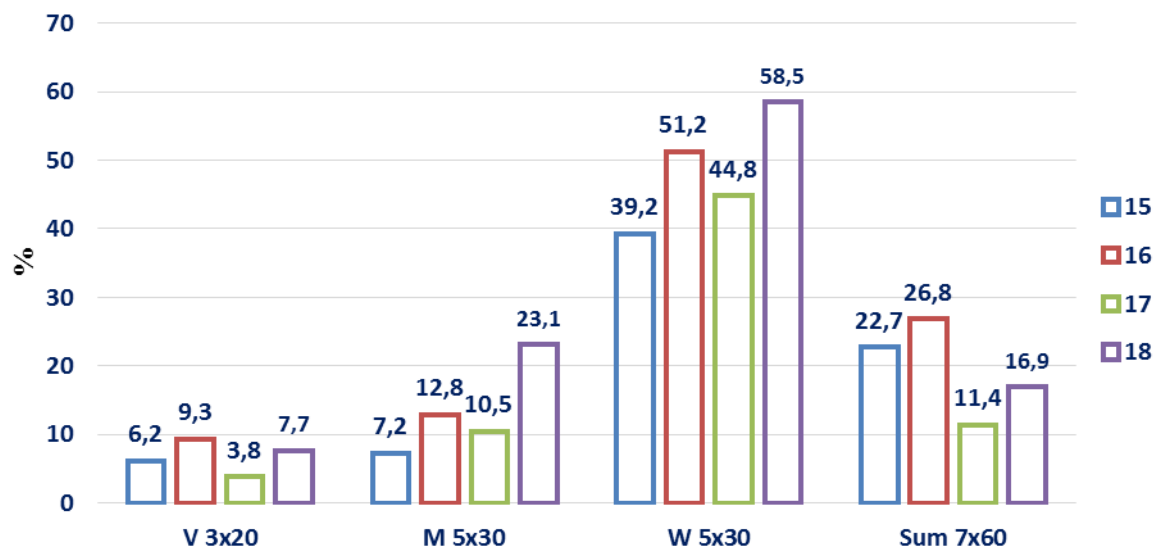
U – statistical value of Mann-Whitney U test

The analysis of physical activity recommendations fulfilment

In analysis of health recommendations fulfilment for performing physical activity, from the aspect of its volume and intensity, we found out in individual age categories (see Graph 1) that the lowest percentage of the recommendations fulfilment was achieved in criterion V 3x20 (intensive physical activity minimally 20 minutes 3 times per week). This recommendation achieved on average only 6.8% female of whole monitored group.

On average, 13.4% of female achieved recommendations for performing physical activity of medium intensity that last 30 minutes minimally 5 times per week (M 5x30). Among specific age categories there were found differences in all criteria. Female in second (V 3x20 and Sum 7x60) and last year (M 5x30 a W 5x30) of study achieved the best results in meeting criteria.

The highest percentage of success rate in meeting criterion achieved female of all age categories in walking five times per week minimally 30 minutes (W 5x30). This criterion was achieved on 48.4% within whole research group.



Graph 1 Physical activity recommendations fulfilment

V 3x20 – vigorous physical activity per week minimally 20 minutes

M 5x30 – medium physical activity five times per week minimally 30 minutes

W 5x30 – walking five times per week minimally 30 minutes

Sum 7x60 – any physical activity seven times per week minimally 60 minutes

The last evaluated criterion from the aspect of health recommendations fulfilment was performing physical activity regardless its intensity (Sum 7x60). Performing any activity that last minimally 60 minutes during every day in week was considered as a fulfilled criterion. This criterion met on average 19.4% of all female. The best results in the criterion achieved 16 years old female (26.8%) and the worst results achieved 17 years old female (11.4%).

There was a very low percentage of female that fulfilled health recommendations. Only 44.3% of 15-year-old females met at least one of the criteria, in 18 years old female it was up to 70.8 %. In total, we can conclude that from whole monitored research group 193 female that are 54.7 % of female met minimally one criterion.

Discussion

Presented results of physical activity of secondary school students in Presov district region, using long version of IPAQ questionnaire, show on low volume values of physical activity presented in MET/minutes/week. Based on comparison with Polish population [10] we can conclude that our research group achieved in individual age categories comparable and better results than Polish population. Polish female achieved totally 2 219.2 MET/minutes/week on average and female from eastern part of Slovakia achieved 3739.73 MET/minutes/week. Total values which were achieved by 17 years old Slovak female are comparable even with Polish male (2640.4) and in three age categories are even higher. It is also important to take account of physical education teaching unit's number in school. While Slovak female have 2 hours of physical education at school [9] in polish research group from 2 to 5 teaching units of physical education.

Interesting is total duration of achieved physical activity according to age. The lowest values achieved in third year of study 17 years old female students and the highest values achieved 18 years old female students. Comparing to Latvia population [11] our research group achieved much lower values. To achieve the level of Latvia youth (5000 MET) our research group is missing more than 1200 MET/minutes/week. In the physical activity structure dominates in our as well as in Polish research group walking. On the other hand, Slovak female achieved higher values of MET/minutes/week in physical activity of medium intensity while polish female on the contrary in physical activity of high intensity.

From the aspect of physical activity recommendations fulfilment, in all age categories were found very low percentage of female (regardless the age) that reached minimum threshold of vigorous (on average 6.8%) and moderate physical activity (13,4%). It corresponds with other research studies indicating that in the countries of the European Union, approximately 2/3 of adolescents do not attain the recommended level of physical activity [30, 31]. The same tendency is revealed in HBSC study where approximately 34% of the adolescents examined did not perform the recommended at least 60 minutes of a moderate effort for 5 or more days weekly [29].

Among those who performed the recommendations there were 40% of boys and 27% of girls [31, 32]. Comparing to our results, values ranged from 7.2% to 23.1% of female within different age categories. Moreover, authors add that this percentage decreased with age, especially among girls [31, 32]. However, it was not confirmed in our study as the amount of undertaken physical activity of female rather increase considering different age categories. Despite health benefits resulting from regular physical activity, the majority of

youth in the developed countries, including Europe and the USA, are characterized by an insufficient physical activity [34, 31] and it was also confirmed in this research study.

Adolescents who did not meet 60 minutes/day in moderate to vigorous physical activity (MVPA) with at least 10–20 minutes/day in vigorous physical activity might have a higher risk of having an excess of body fat than adolescents who meet the daily overall 60 minutes in MVPA [29]. This is the group at an elevated risk of disorders as well as diseases related with insufficient physical activity [33].

The best results considering physical activity recommendations were achieved by criterion walking five times per week minimally 30 minutes. This criterion achieved on average 48.39% of female. It turns out that walking is highest represented criterion whether from the aspect of physical activity recommendations fulfilment as well as in the structure of physical activity presented in MET/minutes/week. Considering another research [35], walkers have also tendency to practice more vigorous and moderate-intensity activities. It corresponds with our results where the group of female (18 years old) that reached the highest percentage rate of physical recommendation fulfilment undertaken the most volume of moderate and vigorous physical activity.

An insufficient level of physical activity noted among female adolescents suggests that it is necessary to pay greater attention to this social group while developing health programmes. The results of the studies presented indicate that it is necessary to continue and intensify actions in promotion of various forms of physical activity among adolescents [36].

One of the limits of the research is application of self-reported questionnaire without combining it with pedometer or accelerometer devices. The weakness of self-reported method is that active adolescents tend to overestimate physical activity, whereas obese adolescents underestimate physical activity [37]. Certain studies [37, 38] call directly for longer lasting monitoring with pedometers because this will enable students to understand better their individual physical activity levels and patterns, and allow them to carry out self-assessments of physical activity.

There is lack of research studies in Slovakia that focuses on physical activity assessment in relation to recommendation fulfilment in all age categories from pre-school children up to senior population. Results of this study should contribute to better understanding of the issue and give inevitable feedback about the levels of undertaken physical activities performed by children and adolescents.

Conclusions

- ✓ More than a half of female students did not perform movement activity of medium or high intensity;
- ✓ The average amount of practised physical activity increased gradually from the aspect of increasing age, except for female at the age of 17;
- ✓ Regardless of age, the most preferable activity among secondary school female students was walking;
- ✓ Female students who were in the first year of study at secondary school practiced less physical activity comparing to those who were in last year of study;
- ✓ From the aspect of physical activity recommendations, the most preferred criterion was for performing any physical activity regardless its intensity (Sum 7x60);
- ✓ Physical activity recommendations seem to be very hard to achieve in the age category, mainly in physical activity intensity.

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