VIGOROUS PHYSICAL ACTIVITY IN THE DAILY PHYSICAL ACTIVITY OF ADOLESCENTS

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- vigorous physical activity,
- physical education.

Abstract:

Short-time vigorous physical activity (VPA) is besides moderate physical activity (MPA) very important in the daily life of adolescents. The aim of this research is to find out the amount of VPA, which is performed by adolescents during the school days regard to the gender and age.

191 girls and 79 boys participated in the research. Accelerometer ActiTrainer™ was used to monitor physical activity (PA) and heart rate (HR) during whole school day. School days were divided into five day periods (before school, school lessons without physical education (PE), PE classes, school breaks, and after school).

Results confirmed the presumption that boys had more VPA than girls during school days in periods before school, PE classes and also during whole day. Older boys spent the longest period of time in the level of VPA compared to other age groups. PE classes were found out as a day period, where participants had in average highest values of spent time in the level of VPA. VPA was detected during school breaks, school classes, PE classes, in time before school and after school. Only 16.5 % of boys and 4.2 % of girls reached total amount of 20 minutes of VPA during whole day.

VPA is a significant component of daily PA in school days of the most adolescent boys and girls. However the results are showing a lack of VPA in both genders, mainly in girls. The results also suggest that PE classes are providing a substantial role of the VPA in the daily PA in adolescent boys and girls during school days.

INTRODUCTION

School plays the important role of moderate-to-vigorous physical activity (MVPA) in adolescents' life because typical school day lasts approximately 6 to 7 hours. Because school-based physical activity (PA) can provide a substantial amount of students' daily PA, there is a recommendation that schools should ensure that all students participate in a minimum of 30 minutes of M-VPA during the school day including time spent being active in physical education (PE) classes [1]. The right school setting can also offer opportunities for students to participate in and enjoy PA outside of PE classes, including school breaks and PA within the classroom. Also active transport to school has the potential to affect the PA of adolescents [1, 2].

Adolescents can achieve substantial health benefits by performing MVPA for periods of 60 minutes or more each day [3-5]. Short-time vigorous physical activity (VPA) is besides moderate physical activity (MPA) very important and VPA should be included at least 3 days

of the week. Recent evidence suggests that VPA may provide greater benefits that MPA in relation to cardiovascular [6], musculoskeletal [7], and psychological health [8, 9]. VPA may potentially be more beneficial to health than MPA. Lack of adherence and/or reductions in overall physical activity levels and affect are counterproductive to health promotion efforts[10].

AIM

In our research we want to find out the amount of VPA, which is made by adolescents during the school days regard to the gender and age. Further we want to determine the role of school in VPA during adolescents' school day.

METHODS

191 girls (age 16.2±1.0; weight 58.6±9.2 kg; height 167.2±6.1 cm; BMI 20.9±2.7) and 79 boys (age 16.1±0.9; weight 68.1±9.5 kg; height 178.5±5.9 cm; BMI 21.3±2.6) participated in the research during years 2009-2012. Participants were divided into four groups depending on their gender and age (Table 1).

Table 1. Participant groups by gender and age

Gender (n)	Age	
	<16 years (n)	≥16 years (n)
Girls (n=191)	74	117
Boys (n=79)	35	44

PA levels were monitored by accelerometer ActiTrainer (ActiTrainer™, Florida, USA). This multifunctional device was together with heart rate monitor Polar (Wearlink T31) recording heart rate, level of PA and number of steps in 15 seconds interval. With the exception of periods of sleep, swimming or personal hygiene, the accelerometer and heart rate monitor was worn the entire day. Participants recorded into record sheet their arrival times at school, beginning and end of each classes and breaks during school-time and departure times from school. After monitoring we were able to divide each participants' day into five periods (before school, school classes without PE classes, school breaks, PE classes, after school) in the special software [11]. This software also provided an individual feedback for each participant. Processed data presented maximal, minimal and average heart rate, duration of PA spent in different levels of maximal heart rate (in percents) and different levels of intensity (in METs), energy expenditure, number of steps and other characteristics. The duration of VPA was set as a summation of individual values of PA levels ≥6 MET.

We used software Statistica 10 CZ [12] for data processing. To analyze data, we used basic statistical characteristics, Kruskal-Wallis test, ANOVA, t-test and cross tables. Results were supplemented by coefficient „effect size" d [13] and η^2 [14].

RESULTS

We found out that both genders have minimal values of spent time in the level of VPA in after school period and maximum values of spent time in the level of VPA in PE classes (Figure 1). The results also confirmed assumption that boys have more VPA than girls during school day. Statistical significant difference was found in the period before school (t=3.17; p=0.002; d=0.42), in PE classes (t=3.87; p=0.000; d=0.52), and in total (t=3.50; p=0.001; d=0.47).

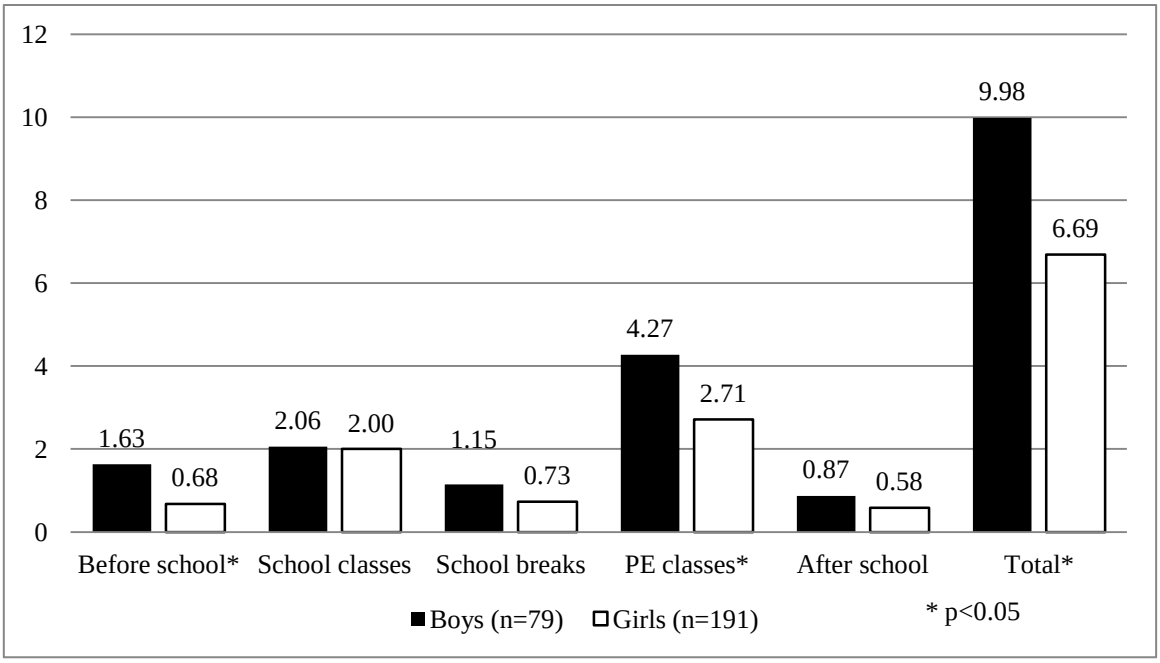

Figure 1. Average time spent in the level of VPA in different periods of day for boys and girls (minutes)

Older boys spent the longest period of time in the level of VPA (11.13 minutes) compared to other age groups (Table 2). PE classes were found out as a day period, when participants had in average highest values of spent time in the level of VPA. Statistical significant values were found between older boys and older girls in the period before school ($H=13.05$; $p=0.005$; $\eta^2=0.049$) and between younger and older girls during school classes ($H=12.07$; $p=0.007$; $\eta^2=0.045$).

Table 2. Average time spent in the level of VPA during different day periods depending to gender and age (minutes)

Day period	Vigorous PA (min)						
	Boys <16 years (n=35)	Boys ≥16 years (n=74)	Girls <16 years (n=44)	Girls ≥16 years (n=117)	H	p	η^2
Before school	1.25	1.94	0.81	0.59	13.05[a]	0,005	0.049*
School classes	0.54	0.57	0.53	0.68	12.07[b]	0.007	0.045*
School breaks	1.01	1.25	0.92	0.60	12.06	0.007	0.045*
PE classes	4.65	3.97	2.86	2.62	10.18	0.017	0.038*
After school	0.90	0.83	0.64	0.54	10.23	0.167	0.038*
Total	8.52	11.13	6.73	6.67	9.91	0.019	0.037*

Note. [a] / differences between older boys and older girls $p<0.05$; [b] / differences between young girls and older girls $p<0.05$; */ small effect size

VPA was registered during school breaks (72.2 % boys; 50.8 % girls), school classes (51.1 % boys; 34.6 % girls), PE classes (87.3 % boys; 78.5 % girls), before school (51.9 % boys; 34.6 % girls) and after school (69.6 % boys; 56.0 % girls) (Figure 2). In total 98.7 % boys and 98.4 % girls reached the level of VPA during school day. But only 16.5 % boys and 4.2 % girls reached the recommendation of 20 minutes of VPA per day, in addition not all of them had VPA continuously for at least 10 minutes.

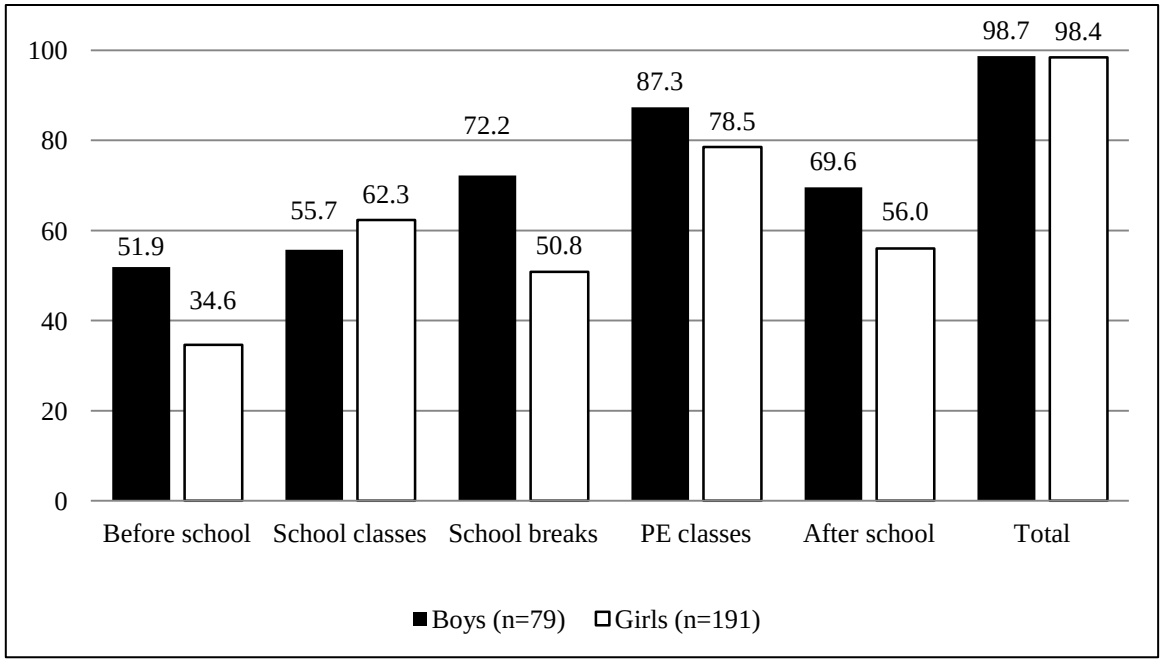

Figure 2. Total number of participants involved in VPA in the different day periods (%)

DISCUSSION

Our results show that 98.7 % boys and 98.4 % girls reached the level of VPA during school day. The highest percent of involved adolescents in VPA was registered in PE classes (87.3 % boys and 78.5 % girls) and further PE classes were found out as a day period, when participants had in average highest values of spent time in the level of VPA. These results support the opinion that schools are a key setting for physical activity interventions [15, 16]. Boys had significantly more VPA than girls in period before school ($p=0.002$), in PE classes ($p=0.000$), and in total ($p=0.001$). These results correspond with researches focused on MVPA [17]. We also found significant differences between older boys and older girls in the period before school ($p=0.005$) and between younger and older girls during school classes ($p=0.007$) but the coefficient η^2 showed small effect size.

CONCLUSION

VPA is a significant component of daily PA in school days of the most adolescent boys and girls. However the results are showing a lack of VPA in both genders, mainly in girls. The results also suggest that PE lessons are providing a substantial role of the VPA in the daily PA in adolescent boys and girls during school days. Further research should focus on adolescents, who do not attend PE lessons for various reasons.

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