

## DAILY PHYSICAL ACTIVITY OF ADOLESCENTS

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### Keywords:

- pulse
- steps
- calories

### Abstract:

Physical activity is an indispensable element of health. Standards concerning the recommended level of useful for health physical activity are higher for children and youth than for adults. Physical activity stimulates somatic, motoric, psychosocial and intellectual development. The period of great importance is also the time, when all the above mentioned changes finish and a child becomes an adult person. Youth aged 16-17 become adult people by overcoming many changes such as body appearance as well as different emotional changes. In this period physical activity helps to get used to one's own appearance, improve self-esteem and build social relationships. Unfortunately young people more and more of them avoid motion by choosing a car as a means of transport or pitting at the front of TV or computer screen. They give up physical education classes, which is often their only form of daily physical activity. The research proves that even 18% of young people aged 14-24 do not participate in any kind of physical activity during a day. Even 5% of them do not even perform such an ordinary activity as walking. The aim of the research is a diagnosis of youth everyday physical activity in their natural environment. The research was conducted by measurement of the level of youth physical activity in particular times of a day i.e. before school, during school classes with particular emphasis on physical education classes, breaks and free time after school.

### INTRODUCTION

Physical activity is indispensable to achieve and maintain health. Recommendations and standards of physical activity useful for health are higher for children and youth than for adults. As far as children and youth are concerned physical activity stimulates somatic, motoric, psychosocial and intellectual development and therefore its standards for these groups are higher than those established for adults [26]. Period when aforesaid development and changes in body ends and when a child becomes an adult person is particularly important. Youth aged 16-17 become adult people by overcoming many changes such as body appearance as well as different emotional changes[29]. In this period physical activity most spectacularly helps to get used to one's own appearance, improve self-esteem and build social relationships. Unfortunately young people more and more often avoid motion by choosing a car as a means of transport or pitting at the front of TV or computer screen. They give up physical education classes, which is often their only form of daily physical activity [2,3,14,16]. The research proves that even 18% of young people aged 14-24 do not participate in any kind of physical activity during a day. Even 5% of them do not even perform such an ordinary activity as walking [9].

The aim of the research is a diagnosis of youth everyday physical activity in its natural environment. The research was conducted by measurement of the level of youth physical activity in particular times of a day i.e. before school, during school classes with particular emphasis on subject classes, break, physical education classes, and free time after school. The research defined also the time of lasting of particular active and passive activities.

## QUESTIONS AND RESEARCH HYPOTHESIS

1. Are there any differences between daily physical activity of girls and boys?
2. What part of the day is the most active time (before school, at school, after classes) as far as number of steps, energy expenditure, and heart rate are concerned?

## RESEARCH MATERIAL

Research was carried out during schoolyear in 2013/2014 among 50 boys and 58 girls aged 16 (Table 1). Everyday for seven days youth was equipped with pedometer and „Actitrainer” accelerometer for 2-3 days. After wake up participants put on aforesaid equipment and have it worn for all day long. till they went to sleep. It enabled collecting results concerning intensity of physical activity expressed by heart rate, energy expenditure and volume of physical activity on the basis of number of steps.

**Tab 1.** Somatic features of participants

Sex	N	Age		Body weight (kg)		Height (cm)		BMI (kg·m <sup>-2</sup> )	
		M	SD	M	SD	M	SD	M	SD
Boys	20	16.22	0.79	68.60	11.18	176.35	6.56	21.93	2.55
Girls	58	16.57	0.67	59.33	8.51	166.79	5.20	21.27	2.46

N – number of participants; M - mean; SD – standard deviation; BMI –Body Mass Index

## METHODS

To prepare measure data we used a special statistical software (designed by The Centre for Kinanthropology\_Research, Palacky\_University), which enables recalculation of energy input required on the basis of time and intensity of a given physical activity expressed in MET-s. The software (registers every 15 s) was used to process data achieved from accelerometer ActiTrainer. In order to calculate results in kcal achieved from Actitrainer we used the following formula  $kcal/min = .0000191 * counts/minute * body\ mass\ in\ kg$  [5]. In order to properly identify range of pulses we used a universal formula for calculating maximum pulse value (for boys,  $HR_{max} = 220 - age$  and for girls,  $HR_{max} = 226 - age$  [7].

Ranges of load were divided with accuracy to 10%  $HR_{max}$  and 1 MET. Intensity of physical activity in the research was divided into low (50-59.9%  $HR_{max}$ ; <3 MET), restrained ( $\geq 60\% HR_{max}$ ,  $\geq 3$  MET) and high ( $\geq 85\% HR_{max}$ ;  $\geq 8$  MET). Basic substance metabolism was calculated on the basis of the following formula:  $((473 * weight) + (971 * height) - (513 * age) + 4687) / 100,000$  for men and  $((331 * weight) + (352 * height) - (353 * age) + 49854) / 100,000$  for women.

For the purpose of calculation we used basic statistical measures, ANOVA variation analysis, Mann-Whitney test and Kruskal-Wallis test.

Statistical analysis was made by means of computer programme Statistica 8 and SPSS 15.

## RESULTS

Analysis of the results concerning physical activity of over 3 MET proved that before starting school boys achieve higher values than girls by 6 minutes. It is statistically proved

( $Z=3,415$ ;  $p=0,000$ ). During the rest of the tested period the values achieved by both groups are similar.

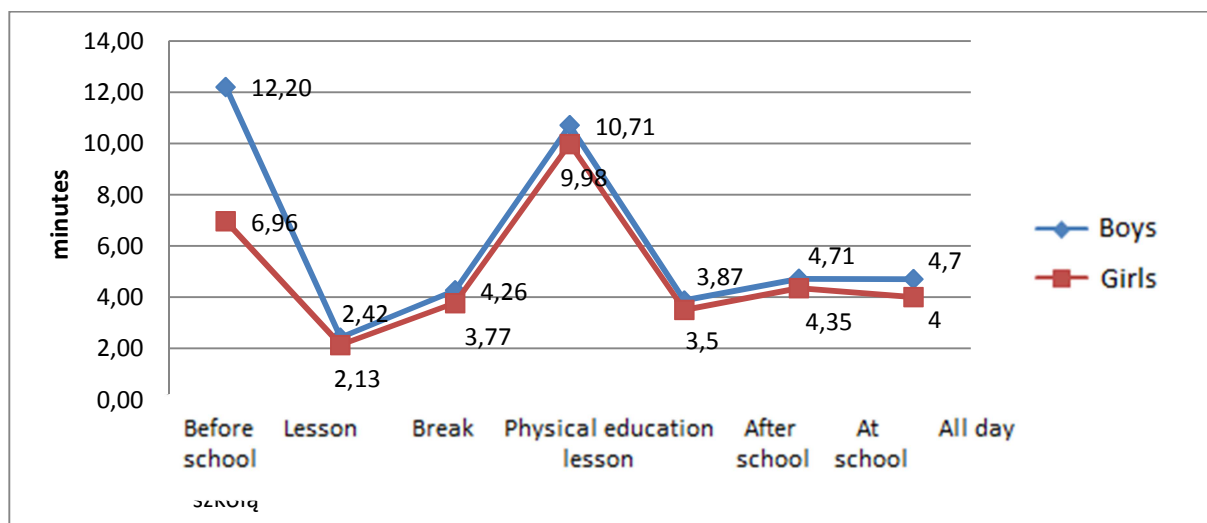


Figure 1. Period of lasting of physical activity

Figure 2 presents the results connected with activity of over 60% HRmax. The differences between girls and boys are apparent before starting school classes ( $Z=2,557$ ;  $p=0,010$ ). Girls are over 6 minutes more active than boys in this period of the day.

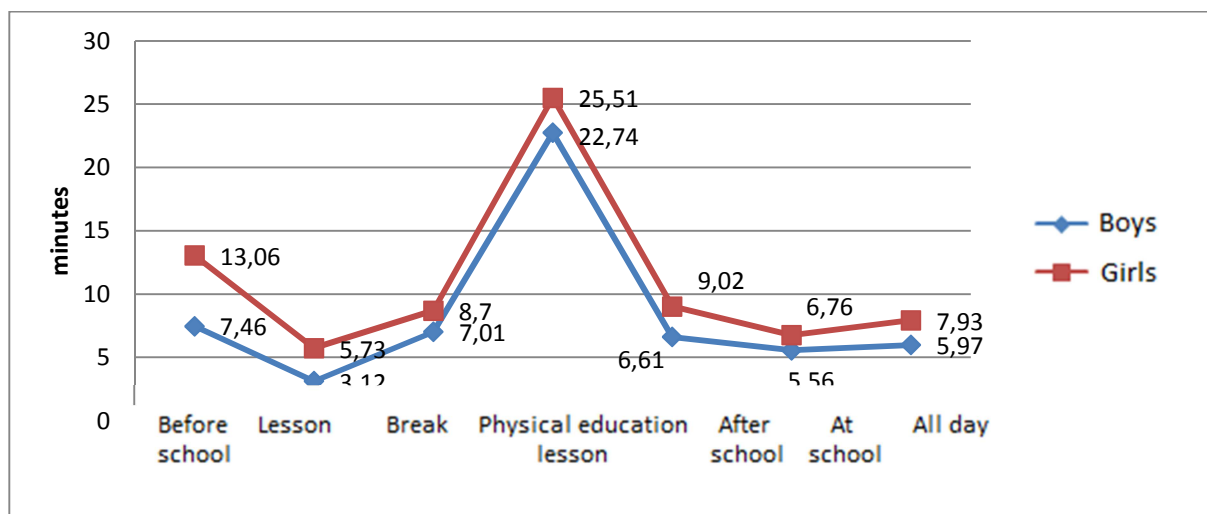


Figure 2 Results connected with activity over 60% HRmax

Average pulse of girls is higher than boys during all the research. The highest value girls and boys achieved during physical education classes. Values of pulse of girls and boys are similar.

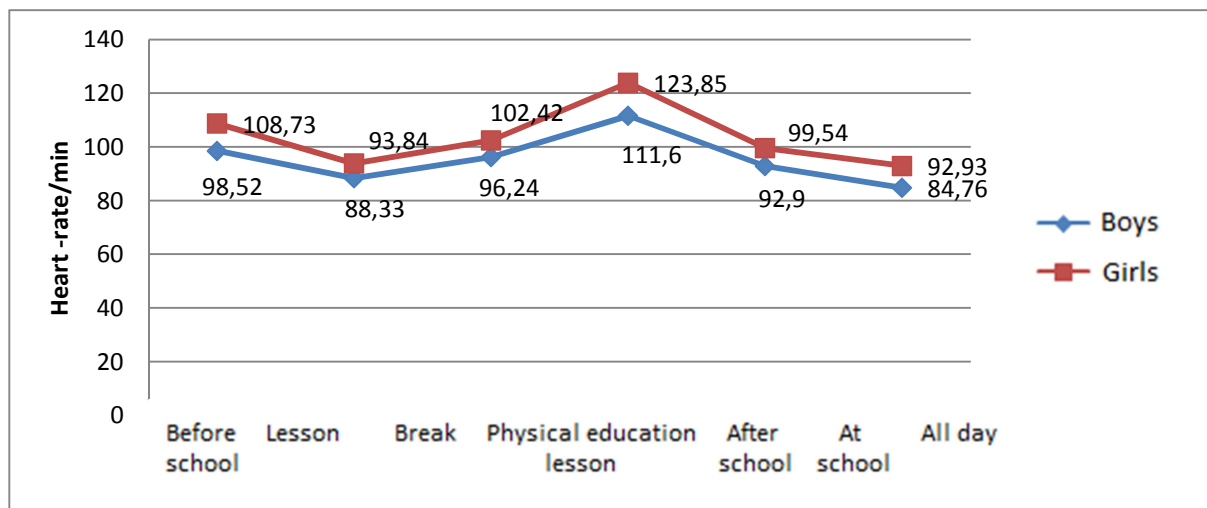


Figure 3. Average pulse value of participants in given parts of the day

Measure of the average number of steps per hour shows that before school boys achieved apparently higher values than girls. These values are confirmed statistically ( $t=2,157$ ;  $p=0,034$ ). For the rest of the researched period values are similar for boys and girls.

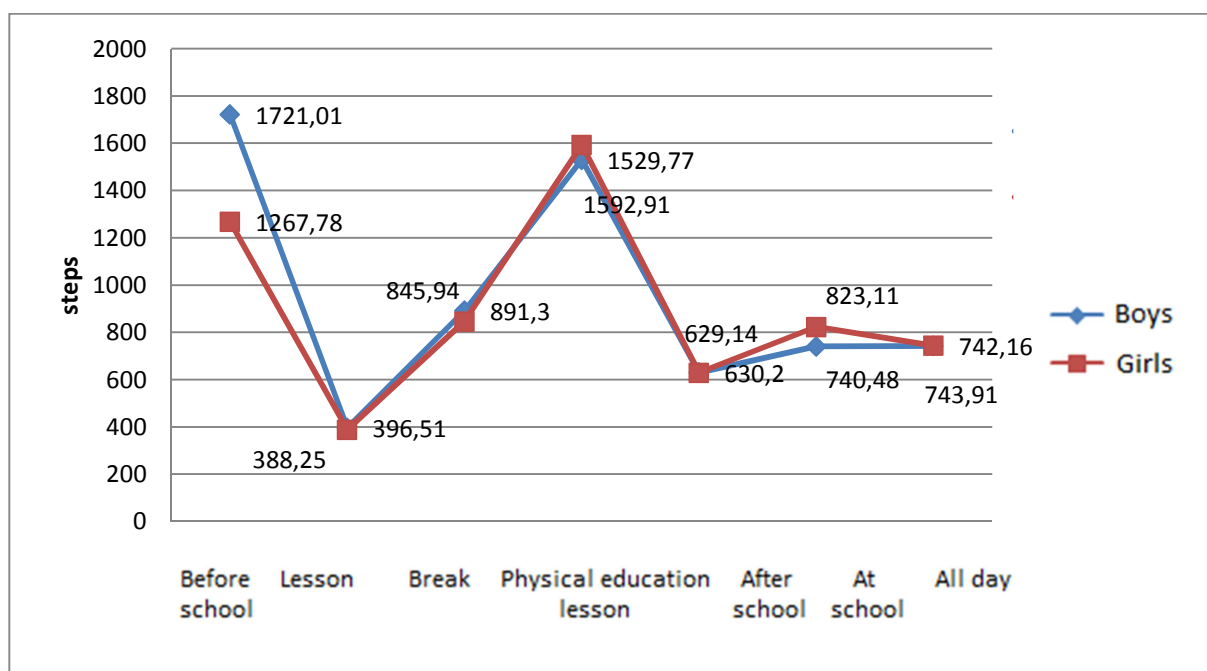


Figure 4. Average number of steps per hour in chosen parts of the day

Figure 5, shows similar to the previous one, that these are boys who before school, achieve higher values of input of energy used per hour and per one kg of body mass (kcal/hour/kg). This difference was statistically proved ( $t=3,069$ ;  $p=0,002$ ). In the remaining researched fields values for both sexes are similar.

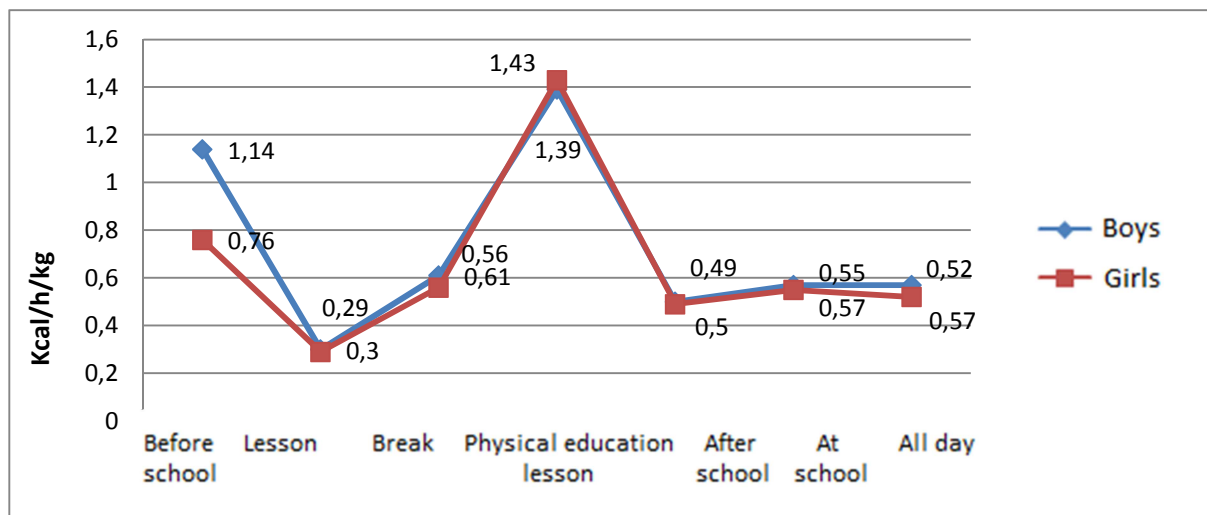


Figure 5. Active energy expenditure used (kcal/hour/kg) in the following parts of a day

Active time presented in minutes during the researched part of a day is similar for both sexes. The biggest difference of 17 minutes was observed during free time after school. Girls are more active than boys. Although this difference is not statistically significant. It should be regarded as useful. This difference has also impact on the results of all day physical activity result. Girl turned out to be 21 minutes more active than boys.

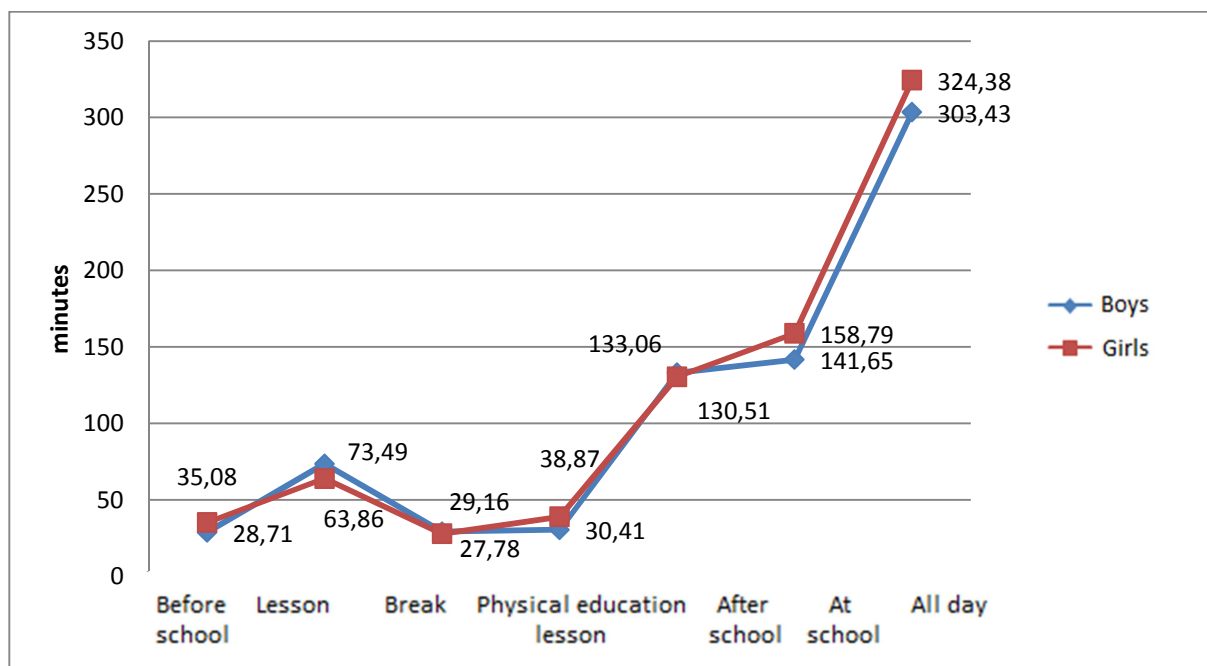


Figure 6. Active time during the following parts of the day.

Analysis of passive time didn't prove any differences between boys and girls (Figure 7).

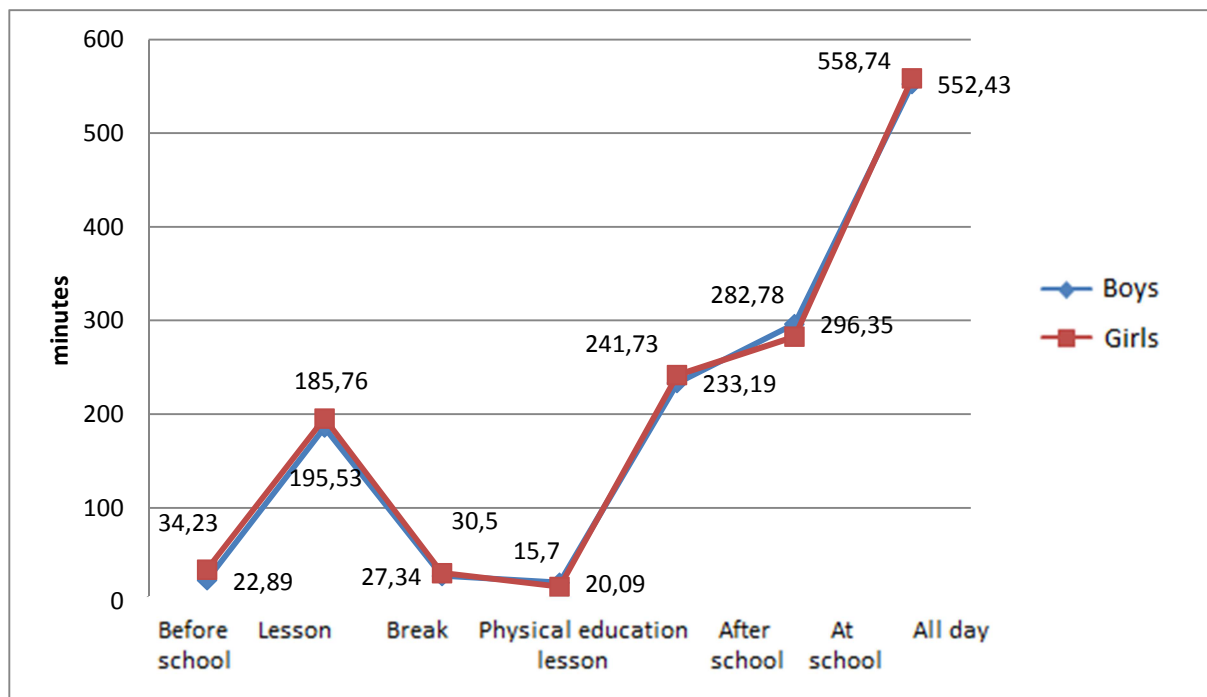


Figure 7. Passive time

Relation of active time to passive time (the higher value, the more physically active youth) proved that the least active period for both sexes are subject classes. The most active period for girls are physical education classes whereas for boys a break between classes. Time after school is more active for girls. The similar relation is apparent during the rest of the examined time (Figure 8). Differences are not proved statistically.

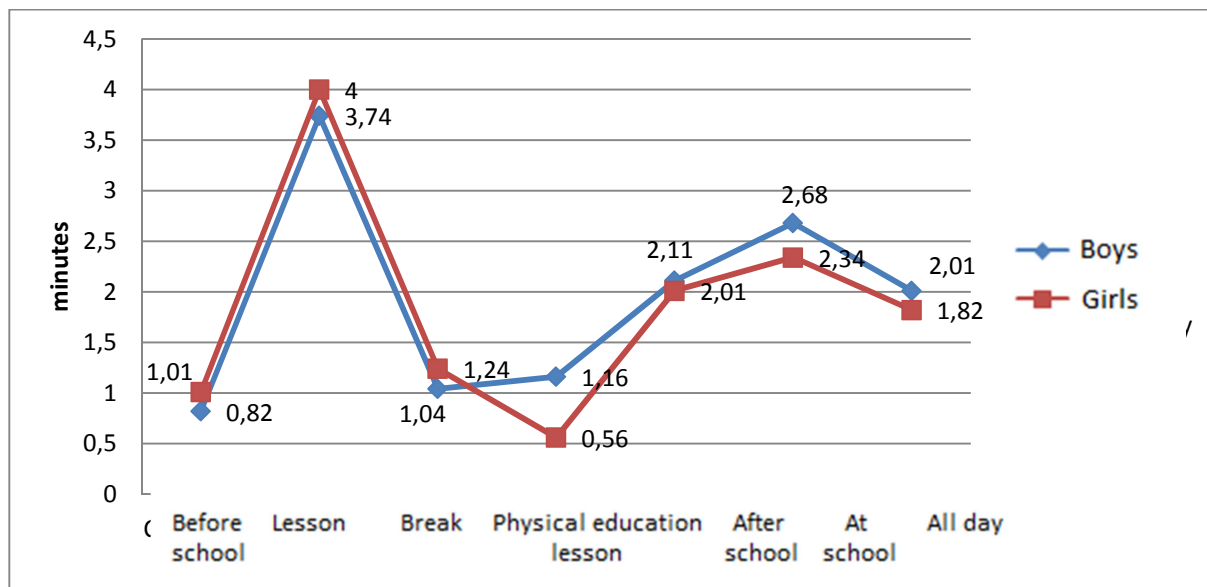


Figure 8. Relation of active time to passive time

Analysis of the activity intensity indicates that for boys lesson of physical education is time, when values expressed in MET-s as well as HRmax are the highest. Relatively high values are also achieved before school classes. The lowest values are achieved during subject classes and after school.

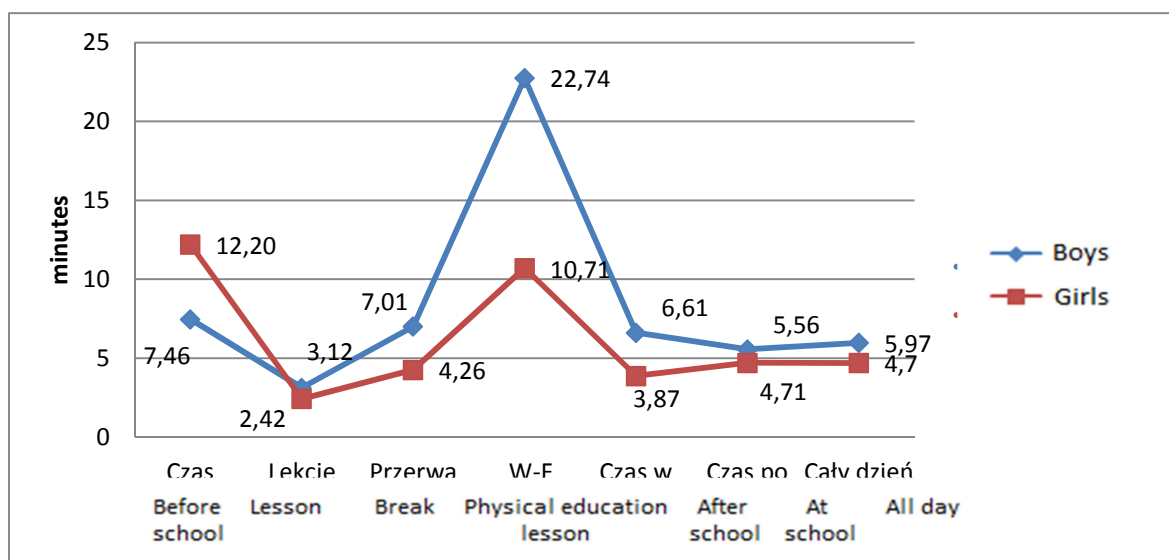


Figure 9 Period of physical activity exceeding 60% HRmax and 3 MET-s for boys.

For girls the higher values of physical activity exceeding 3 MET-s and over 60% HRmax were also achieved during physical education classes. Both values were also high before school. The lowest values were achieved during subject classes and after school, which is similar situation as for boys (Figure 10).

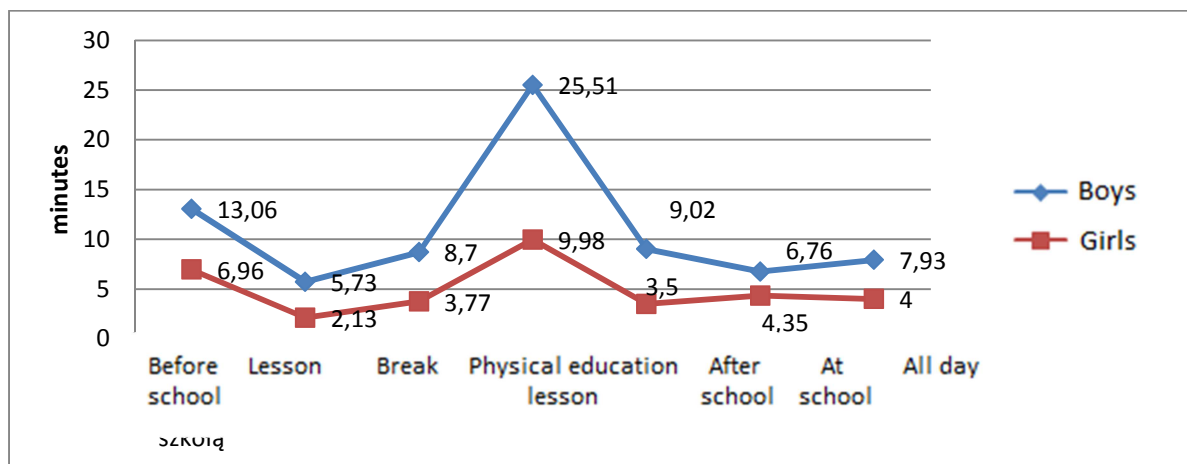


Figure 10. Period of physical activity exceeding 60% HRmax and over 3 MET-s for girls.

## DISCUSSION

Analysis of the results indicated that average pulse for boys is lower than for girls during all the examined periods of a day. However it is connected with formulas used to calculate maximum pulse values. For girls a formula used was  $226 - \text{age}$ , whereas for boys we used a formula  $220 - \text{age}$  [7]. Boys were more active than girls with regard to number of steps and input of calories lost before school. However analysis of the values achieved during school classes does not significantly differentiate boys and girls with regard to number of steps and input of energy used.

The most active period during all day was physical education lesson as far as number of steps, calories and pulse are concerned. This result was achieved both by boys and by girls which shows the importance and great role of physical education lesson. In increasing all day physical activity level [18]. It is of great importance, especially when competitors of physical activity are PC, television and the Internet. Its effect is significant setback of physical function and capacity of youth. It was already indicated by the research carried out between 1979-



1999, in very numerous groups of children and youth (aged 7,5-19,5 years old ) [21]. Physical education lesson is for many children the only environmental factor, which enables shaping functional possibilities [6,8,13]. „Optimal level of physical activity of children and youth is such a level, which meets the movement needs and stimulates the development of their organisms” [6]. In contrast, there is a growing tendency towards refusing of this only form of physical activity which is physical education lesson among post primary students. Research proved that during the whole day it were just girls who achieved higher pulse and more often their HRmax exceeded 60%. It can be the effect of the fact that their level of physical capacity and physical fitness was lower than of boys by the same physical exercises done. Maybe girls put more effort in exercises done during physical education classes, where the difference is apparent. This thesis can be explained in the following way: despite boys reached higher values of steps, calories and exercise of over 3 MET-s before physical education classes finally with beginning of school classes these values were becoming equal and maintained equal till the end of the day. Passive time for both sexes was almost identical. Whereas active time was much more diversified.

What is interesting, the highest level of physical activity was achieved during a break, and then during PE classes. The reason of its result can be stress connected with tests or other forms of credits and passes at subject classes, which took place after a break. Maybe students used a break to go outside the school, which could be the reason of appearing higher values. Finally after all day of tests, values concerning the relation of active time to passive time for girls are higher, which indicates for their lower physical activity during a day in comparison to boys.

Contrary to international research carried out by HBSC (Health Behavior in School-aged Children) in 2002, according to which most teenagers (59% of boys and 71% of girls) in Poland does not achieve the recommended level of physical activity, which is 60 minutes a day for 5 days in a week [25,27]. Other scientists also confirm a hypothesis that boys have higher level of physical activity [10,11,12,15,17,19,22]. Research by HBSC and others [4,15], also prove that physical activity of youth of both sexes declines with age.

## **SUMMARY**

Despite common knowledge concerning the necessity of participation in physical activity, particularly for children and youth it is not easy task to encourage youth to take up any physical activity. Its main reason may be a dispersed identity observed by 15 – 16 years old youth, causing lack of long-term view thinking and attitude towards everything being now, being easy and nice but also depressive disorders and reluctance to any kind of activity<sup>1</sup>. Besides a breakthrough, between childhood and adolescence which is experienced by the tested participants, is a period when teenager fights with many social problems. They are often connected with self-esteem, initiating of intimate relations with opposite sex and shaping sex, group and individual identity of a young man. Therefore emotional lability is fully explicable and understandable. However it very often takes place with predominance of negative emotions and black white thinking [24].

Reason of most often taking place absence from physical education classes might be the fact that even 33 % of post-secondary students and one fifth students of primary school declared that physical education classes are not interesting. In turn, it can be the effect of the fact that 55% of schools do not take into consideration the infrastructure they possess in performing physical education classes, 74% of schools do not perform any kind of action preventing from downward trend of attendance of students in physical education classes and 86% of schools controlled by the Ministry of Sports and Tourism do not investigate the problem of active participation of students in physical exercise classes [23]. Fact that, for most of the participants a lesson of physical education is the only chance to increase daily activity,



confirms that with end of physical education classes a level of physical activity of both boys and girls declines. On this basis we can conclude that despite wide range of different forms of activities available, youth very often decides for the passive forms of spending free time after coming back home from school. Therefore the more important is the role of physical education, whose task is not only to encourage to active physical exercise but also make awareness and educate towards active spending of spare time. Health education introduced at schools as an element of physical education is aimed at shaping pro health attitudes, beliefs and skills. Its task is also to make aware that physical activity is inseparable from health [28].

## CONCLUSION

1. There are not any significant differences between physical activity of boys and girls. The only time when boys are more active than girls is before school.
2. The most active time as far as number of steps, energy expenditure and heart rate are concerned are physical education classes.

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