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THE INTENSITY OF PHYSICAL ACTIVITY DURING PHYSICAL EDUCATION LESSONS OF 5TH - 6TH GRADE PUPILS

Asta Sarkauskiene - Professor at the Department of Sport, Recreation and Tourism, Klaipeda University, Lithuania;
H. Manto st. 84, 92294 Klaipeda, Lithuania;
E-mail: asta.sarkauskiene@ku.lt .

Abstract

Objectives. The aim of this study was to determine the intensity of physical activity during PE lessons of 5th - 6th grade pupils.
Methods. The study subjects consisted of 58 fifth – sixth grade pupils between the ages of 11 and 13, from four Klaipeda city general education schools (Lithuania), selected by convenience sampling. The study included 27 fifth-graders (55% girls) and 31 sixth-graders (45% girls). The study involved the monitoring of heart rates (HR) during PE lessons by Polar M400 heart rate monitors. HR was measured for 3 lessons in each class, for a total of 12 lessons.
Results. 5th grade pupils spent most of their time in all PE lessons in targeted medium to high intensity zones, but there were also PE lessons where pupils did not reach the required zones or were above the required zone. The pupils' mean heart rate of all PE lessons was 148 ± 9.95 bpm, and the maximum heart rate was 184.04 ± 6.13 bpm.
The biggest part of 6th grade pupils' PE lessons physical activity intensity was within the recommended levels in medium-high intensity zones. In all PE lessons, the average heart rate of the pupils was 147.28 ± 9.65 bpm, and the maximum heart rate was 182.16 ± 8.38 bpm.
Conclusion. The intensity of PE lessons met the recommendations - more than 50 % of physical activity during lessons was of medium to high intensity. Our study revealed that the change in pupils' heart rate during a PE lesson was influenced by both factors – the type of activity and the lesson task. Depending on gender, girls had higher values regarding the percentage of lesson time in MVPA than boys.
Keywords: heart rate, intensity, physical activity, pupils.

Introduction. Constantly increasing physical inactivity is one of the main risk factors for chronic, non-communicable diseases (WHO, 2020). Cardiovascular diseases are the number 1 cause of death globally, taking an estimated 17.9 million lives each year and estimated 31 % of all deaths worldwide (WHO, 2019). Although the benefits of physical activity for the prevention of cardiovascular and other chronic non-infectious diseases are obvious, physical activity in all age groups is insufficient.

Researchers who have studied the physical activity of children aged 11-13 say that a large proportion of pupils have lower levels of physical activity than recommended. Health Behaviour in School-aged Children (HBSC) research presents data from over 220 000 young people (11, 13 and 15 years old) in 45 countries and regions in Europe and Canada. It was found that only a quarter of 11-year-olds (21% of girls, 27% of boys) are sufficiently physically active (Inchley, J. et al. (ed.), 2020).

Children and adolescents should do at least an average of 60 minutes per day of moderate to vigorous-intensity, mostly aerobic, physical activity across the week (WHO, 2020). Regarding

exercise intensity, the American College of Sports Medicine (ACSM) recommends an intensity between 40-89 % of heart rate reserve (HRR), called Moderate to Vigorous Physical Activity (MVPA). These recommendations have resulted in an improvement in cardiorespiratory fitness and, therefore, they can help prevent the rise of overweight and obesity rates (American College of Sports Medicine, 2011). Concerning exercise intensity, scientists (Dudley, Okely, Cotton, Pearson, & Caputi, 2011; Howe, Freedson, Alazan, Feldman & Osganian, 2012) suggested that 50 % of the Physical Education (PE) class time should involve MVPA in order to improve cardiovascular fitness. Due to its validity and reliability, a heart rate monitor is probably the most common objective method to assess children's physical activity levels as well as for assessing MVPA (Duncan, Badland & Schofield, 2009).

PE is a required academic subject that teaches participation in lifelong, health-enhancing physical activity. In PE, pupils learn to work as a team, develop healthy personal fitness habits, and set fitness goals now and throughout their lives. Like other academic subjects, PE is based on a curriculum, with learning standards. Pupils learn a wide range of skills in PE, not just sports.

Research questions:

1. What proportion of PE lessons pupils spend in the MVPA zone?

2. Do girls and boys have different cardiovascular responses to exercise during the same duration and intensity of physical exercise during PE lessons?

Objectives. The aim of this study was to determine the intensity of physical activity during PE lessons of 5th - 6th grade pupils.

Methods. The study subjects consisted of 58 fifth – sixth grade pupils between the ages of 11 and 13, from four Klaipeda city general education schools (Lithuania), selected by convenience sampling. The study included 27 fifth-graders (55% girls) and 31 sixth-graders (45% girls).

Data were collected during PE lessons, which were organized in different type of activities. The teachers were instructed to maintain their usual methods of teaching, and pupils were informed to do everything as usual.

Moreover, the study involved the monitoring of heart rates (HR) during PE lessons by Polar M400 heart rate monitors. All children wore a heart rate monitor during the lesson time. Data recording began when the teachers would officially start the lessons and stopped at the end. HR was measured for 3 lessons in each class, for a total of 12 lessons. In Lithuania, the duration of PE lessons is 45 min., frequency - three times per week.

For the descriptive treatment of the different variables analysed (age, mean HR, and percentage of time in MVPA), average and statistic deviation (SD) was obtained.

Results. 5th grade pupils' mean heart rate and percentage of moderate to vigorous intensity physical activity (MVPA) based on the type of activity and lesson task are described in table 1.

Table 1. 5th grade pupils' mean heart rate and percentage of moderate to vigorous physical activity (MVPA) based on the type of activity and lesson task

Type of activity, lesson task	N	MEAN HR (bpm) M±SD	MVPA (%) M±SD
Lesson 1: Volleyball (improvement of technique)	6	162.5±16.7	67.2±12.9
Lesson 2: Volleyball (improvement of technique)	7	156.7±17.1	86.7±10.6
Lesson 3: Volleyball (examination of technique)	6	149.8±17.2	99.45±17.6
Lesson 4: Dodgeball (improvement of technique)	16	138.69±15.7	62.79±12.6
Lesson 5: Motor skills (Increase in Physical Fitness)	14	137.86±13.5	80.01±10.7

Lesson 6: Football (improvement of technique)	14	144.21±22.16	86.08±13.6

Abbreviations: HR (Heart Rate); MVPA (moderate to vigorous physical activity)

5th grade pupils spent most of their time in all PE lessons in targeted medium to high intensity zones, but there were also PE lessons where pupils did not reach the required zones or were above the required zone. The pupils' mean heart rate of all six PE lessons was 148 ± 9.95 bpm, and the maximum heart rate was 184.04 ± 6.13 bpm.

Analysis of girls' and boys' response to exercise revealed that the exercise was suitable for boys in all six PE classes, but girls' exercise was sometimes too intense: the mean heart rate of girls was 149.45 ± 8.23 bpm, maximum - 185 ± 7.29 bpm. Analysis of the load distribution by intensity zones revealed that most of the load was in the high and very high intensity zones. The mean heart rate in boys was 147.70 ± 14.72 bpm with a maximum of 182.89 ± 10.76 bpm. Analysis of the load distribution by intensity zones revealed that most of the load was in the medium and high intensity zones. 6th grade pupils' mean heart rate and percentage of MVPA based on the type of activity and lesson task are described in table 2.

Table 2. 6th grade pupils' mean heart rate and percentage of moderate to vigorous physical activity (MVPA) based on the type of activity and lesson task

Type of activity, lesson task	N	MEAN HR (bpm)	MVPA (%) M±SD
Lesson 1: Basketball (improvement of technique)	14	157.00±11.3	77.3±12.0
Lesson 2: Motor skills (Increase in Physical Fitness)	13	137.69±13.9	79.3±9.5
Lesson 3: Individual needs	12	147.85±8.8	75.68±8.8
Lesson 4: Badminton (improvement of technique)	10	149.20±17.9	68.05±12.5
Lesson 5: Badminton (improvement of technique)	11	143.55±18.4	84.39±10.6
Lesson 6: Individual needs	12	147.17±15.6	95.44±12.6

Abbreviations: HR (Heart Rate); MVPA (moderate to vigorous physical activity)

The biggest part of 6th grade pupils' PE lessons physical activity intensity was within the recommended levels in medium-high intensity zones. In all six PE lessons, the average heart rate of the pupils was 147.28 ± 9.65 bpm, and the maximum heart rate was 182.16 ± 8.38 bpm.

The analysis of girls' and boys' response to physical activity revealed that the load in all six PE lessons was purposefully allocated according to the methodological requirements of the PE lesson: the average heart rate of girls was 142.79 ± 10.52 bpm, the maximum - 188.60 ± 14.34 bpm. Analysis of the load distribution by intensity zones revealed that most of the load was in the medium intensity zone. The mean heart rate in boys was 148.58 ± 9.37 bpm, with a maximum of 185.41 ± 13.36 bpm. Analysis of the load distribution by intensity zones revealed that most of the load was in the high intensity zones.

Conclusion. The intensity of PE lessons met the recommendations - more than 50 % of physical activity during lessons was of medium to high intensity. Our study revealed that the change in pupils' heart rate during a PE lesson was influenced by both factors – the type of activity and the lesson task. Depending on gender, girls had higher values regarding the percentage of lesson time in MVPA than boys.

However, based on these data, combined with the weekly frequency of PE lessons, it is clear that PE can only do so much in supplementing young people's daily volume of physical activity.

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