ASSESSMENT OF THE INTENSITY OF PHYSICAL EDUCATION LESSONS ON THE BASIS OF SELECTED FORMS OF PHYSICAL ACTIVITY OF CHILDREN AND YOUTH

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Keywords:
- children
- heart rate
- intensity of exercises
- physical education lesson

Abstract:
Objectives: The aim of the study was a comparative assessment of the intensity of the main part of a physical education lesson of primary school children participating in three classes differing in terms of the prevailing form of physical activity. **Material and methods:** The whole study was carried out within a voivodship conference for physical education teachers, entitled: 'Diagnostics in sport of children and youth'. The study comprised 30 pupils. **Results:** The children remained in the heart beat interval (%HR max) between 50 and 59 for the period of 5 minutes and 11 seconds of the class. The intensity interval between 60 and 69% of HRmax lasted the longest during the course of the lesson (10 min and 14 s). The intensity of the lesson at the level of 70-79%HR max was observed by 9 min and 31 s. For 4 min and 53 s the classes were taking place in the HR interval of 80-89%HRmax, while the HR interval of 90-100%HR max occurred only for 11 seconds. **Conclusions:** It seems that physical education teachers have a problem with the choice of the shaping intensity of physical education classes already at the level of planning.

INTRODUCTION

A physical education lesson constitutes the basic organisational and methodological unit of school physical culture. Each lesson should have a definite didactic and educational structure. The structure of the physical education lesson, factual and methodological qualifications and the appropriate choice of exercises have an essential impact on the realisation of, so called, instrumental and performance objectives of physical education and teaching. Among those objectives, an important place is occupied by: a harmonious morpho-functional development of the pupils' bodies through the choice of means (exercises and physical activities) stimulating and correcting the process of development and functioning of the following systems: the motion system, the cardiovascular system, the respiratory system, the nervous system; the comprehensive development of motor, stamina-related and coordination skills as well as the spine and abdominal muscle agility or toughening up against unpleasant physical and mental stimuli [Pańczyk, Warchoł 2006].

Unfortunately, in the opinion of numerous authors, physical education lessons are antiquated and lacking in efficiency [Pańczyk 1999; Bukowiec 1990; Frołowicz 1994; Perkowski et all. 1995; Przewęda 1985; Raczek 1995; Sozański, Śledziewski 1996]. Physical education as a school subject does not have a bigger share in the improvement of health of the society – first of all, due to the lack of essential correlations between the curricula realized and the healthy, which means mostly physically active, lifestyle of children and youth [Drabik

1996; Krawański 2010]. Besides, obligatory physical education classes are characterised by: low efficiency, low intensity, absence of the pupils, (increasing with age), insufficient accentuating of health aspects and, sometimes, an infantile way of conducting the class, treating the lesson as a form of preparation for only one sports discipline, fear of effort, teacher or the mark [Frołowicz 1998]. Demel M. points out that the lessons often do not constitute a process, but they are motor episodes, and sometimes they even create the impression of being feigned actions [Demel 1992]. Very often, while organising or realizing lessons of physical education, we can notice a preference for activities resulting from the consumerist lifestyle – substitutes for action in a closed room [Pańczyk 1999].

That is why – in the opinion of the authors of this work – in today's process of school physical education, we should pay definitely more attention to the level of lesson intensity, measured by the heart rate (HR). This claim stems from the positive influence of activity on the body. The work of muscles and activity are not only factors necessary to maintain psychophysical fitness and endurance of the adults, but also a very essential developmental factor for a growing organism, that is for children and youth. Growing and development are not a mechanical process making use of nutrition and assimilation. For the proper growth, for the proper process of synthesis of organic matter, what is necessary is the alternation of assimilation and dissimilation, phases of stimulation and rest following each other. These processes cannot take place correctly in the state of inaction or a limited physical activity [Pańczyk 2005]. Lack of activity hinders rational use of digested meals, contributes to obesity and makes its treatment harder, impairs peripheral vascular system, weakens ligaments and muscles, increases the risk of joint injuries, decreases the immunity to everyday hardships [Kuński 1987]. Hence, it could be said that activity is a biological necessity and it can have both a preventive and a therapeutic character.

While writing about the influence of activity on a human body, it should be also underlined that its positive influence takes place when this activity is characterised by an appropriate level of intensity (HR). It is assumed that the physiological – lower limit of the optimal exercise load for children and youth is contained within the range of values between 140 and 150 heart beats per minute [Świerzko et al. 2014].

Physical education lessons conducted below this physiological threshold may positively affect the body of a young person only to a slight degree. Hence the necessity of conducting empirical studies into the real level of intensity of school physical education.

Aim of the study

The aim of the study was a comparative assessment of the intensity of the main part of the physical education lesson of primary school pupils, participating in three activities differing in terms of the prevalent form of physical activity.

Research questions:

1. What was the intensity of the physical education classes.
2. Was the intensity dependent on the type of the lesson conducted.
3. Do physical education teachers plan classes at the optimal intensity level for children.

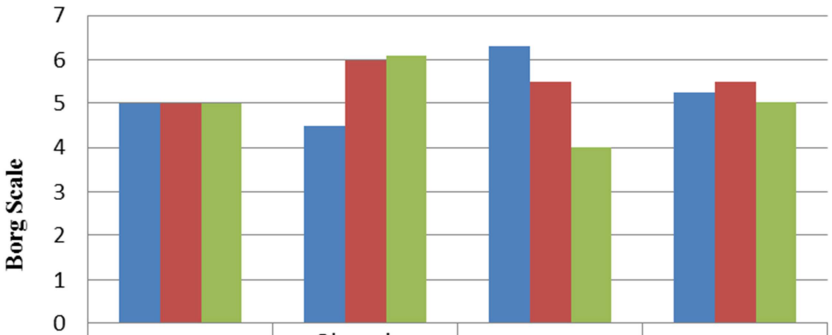
MATERIAL AND METHODS

In the study, we used the observation and experiment methods. Considering the topic and the scope of the research, for the collection of empirical data, the direct observation technique was used. The experiment, on the other hand, consisted in the comparison of three physical education lessons, differing with reference to the level of physical effort. The analysis of the heart rate during the physical education classes was performed with the use of the Team 2 System by Polar. The object of the research consisted of pupils from the Complex of Schools no.1 in Dębica. The whole research was conducted on 12th of December 2015,

during a voivodship conference for physical education teachers, entitled *Diagnostics in sport of children and youth*. The study comprised 30 pupils. The organization of the research process was as follows:

1. In the random sampling, from the group of 60 12-year-old children, three groups of pupils were selected, 10 people in each, to participate in three different physical education classes. The first group participated in a floorball lesson, the second group in a volleyball lesson and the third group – in games and activities with elements of gymnastic exercises. Preserving the structure of a physical education lesson, the classes were shortened to 30 minutes. The classes in each group were conducted according to the classical arrangement of the lesson process, so there were organizational and regulatory activities, motivation for active participation in the lesson, warm-up (shaping exercises) lasting 10 minutes, technical and tactical exercises (lasting 10 minutes) and a simplified game (in the case of the floorball and volleyball lesson) and games and activities, so called 'row race' (in the gymnastic exercises), body calming (breathing exercises), organizational and regulatory activities (final ones) and the discussion and summary of the class (lasting 10 minutes). The lessons were conducted by physical education teachers with many years of teaching experience.
2. Each exerciser was equipped with a Polar Team 2 sport tester.
3. The level of intensity of the exercises was assessed on the basis of the number of heart beats per minute and the percentage value of the maximum heart rate (%HR max) of each pupil, calculated from the value of the maximum heart rate obtained during a 20 meter shuttle test 20mSRT (constituting also the warm up) performed half an hour before the beginning of the lesson (the average heart rate of the whole test group amounted to 200 beats/min). The level of lesson intensity was monitored live.
4. Immediately after the completion of the classes, in order to assess their intensity subjectively, an interview was conducted among the children participating in the lesson, the teachers conducting it and the observing teachers. The assessment of the intensity was conducted on the basis of the 10-degree Borg scale.

RESULTS



	Teacher	Observing teacher	Children	Borg Average
Volleyball	5	4,5	6,3	5,3
Floorball	5	6	5,5	5,5
Gymnastics	5	6,1	4	5,0

Diagram 1. Subjective assessment of the class intensity on the basis of the Borg scale

The teachers who had conducted the lessons with the pupils assessed their classes at the level of 5 in the 10-degree Borg scale. On the other hand, the teachers observing the classes made the following assessments: volleyball (4.5), floorball (6), gymnastics (6.1). However, the children participating in the volleyball class chose the mark 6.3, in the floorball class: 5.5

and for gymnastics – 4. The average, according to the Borg Scale, amounted to: for the volleyball – 5.3, for the floorball – 5.5 and for the gymnastics – 5.0 (diagram 1).

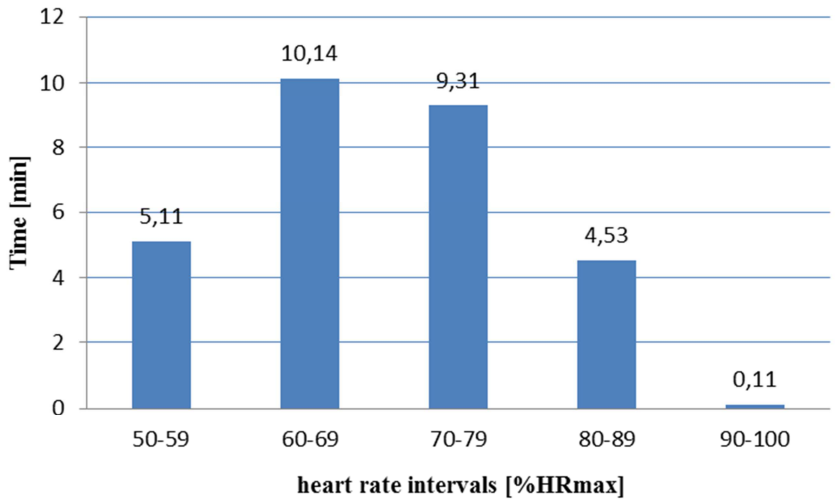


Diagram 2. Average exertion time of the pupils in particular areas of activity during 30-minute physical education classes.

The children remained in the heart beat interval (%HR max) between 50 and 59 for the period of 5 minutes and 11 seconds of the class. The intensity interval between 60 and 69% of HRmax lasted the longest during the course of the lesson (10 min and 14 s). The intensity of the lesson at the level of 70-79%HR max was observed by 9 min and 31 s. For 4 min and 53 s the classes were taking place in the HR interval of 80-89%HRmax, while the HR interval of 90-100%HR max occurred only for 11 seconds (diagram 2).

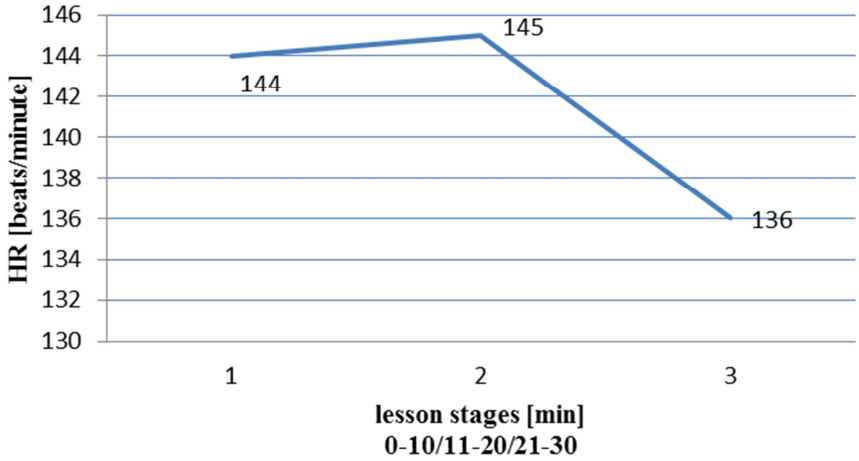
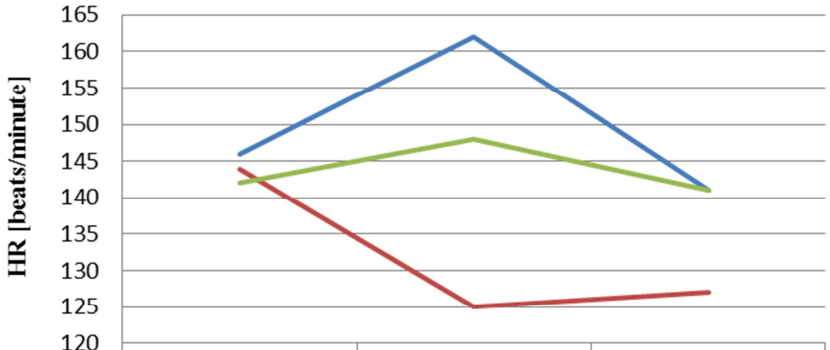


Diagram 3. Average heart rate (HR) in consecutive 10-minute stages of the lesson

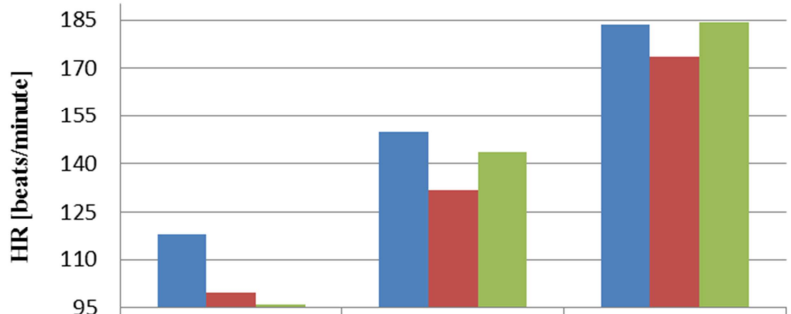
In the first 10-minute stage of the classes observed, the average HR amounted to 144 (beats/min), in the second 10-minute stage it was 145 (beats/min), and in the last 10 minutes of the lesson the average HR amounted to 136 (beats/min) (diagram 3). The average HR value of the lesson was 142 beats per minute.



	1	2	3
Volleyball	146	162	141
Floor hockey	144	125	127
Gymnastics	142	148	141

Diagram 4. Average heart rate of the pupils in consecutive 10-minute stages of the lesson with respect to the topic of the class.

In the volleyball class, the distribution of the average heart rate in the three 10-minute stages of the lesson was as follows: the first stage – 146, the second stage – 162, the third stage – 141 beats/minute. In the floorball class, the average heart rate in the consecutive stages of the lesson was as follows: the first stage – 144, the second stage – 125, the third stage – 127 beats/minute. The most regular distribution of the average value of the heart rate was noticed in the lessons of gymnastics: the first stage – 142, the second stage – 148, the third stage – 141 beats/minute.



	min	average	max
Volleyball	118	150	184
Floor hockey	100	132	174
Gymnastics	96	144	184

Diagram 5. The average value of the heart beats per minute during the 30-minute lesson with respect to the min-max values and the topic of the class.

The minimum value of the heart rate during the volleyball lesson was 118 beats/minute, in the floorball – 100 beats/minute, in the gymnastics – 96 beats/minute. The highest value of the heart rate, 184 beats/minute, was found in the volleyball lesson and in the gymnastics. The highest average value of the heart rate for the whole lesson unit, 150 beats/minute, was noticed during the volleyball class, and the lowest, 132 beats/minute in the floorball class.

DISCUSSION

The developmental, motor and health effects of the physical education lesson depend on the intensity and capacity of physical activity [Pańczyk 1999; Raczek 1995]. The quality and

quantity of the physical activity affect the development and the health of the children, with special emphasis on the school age, but also the adult life [Raczek 1995]. The linear relationship between the heart rate and the oxygen consumption during the exercise allows us to, indirectly, assess the intensity of the physical activity in the context of the physical education class [Raczek 1995]. It is assumed that the most optimal level of exertion intensity during a physical education lesson, which has a significant effect on the shaping of the efficiency of the body consists in the exercises which approach the, so called, anaerobic metabolism threshold. For 14-16-year-old children, that parameter lies within the interval of 160 to 190 beats per minute, while at a younger school age, the value of that parameter exceeds 200 beats per minute [Świerzko et al. 2014].

The research conducted by the authors of this work confirmed the difference in the intensity of the physical education class, depending on the prevalent form of physical activity, and also the fact that in a typical physical education lesson we obtain too low values of the heart beats per minute, which results in the fact that the physical education lessons lack in efficiency in terms of physiology [Świerzko et al. 2014]. The average heart rate of the children during the first minute of the shuttle run (140m) at the speed of 8km/h amounted to 152 beats/minute, which constituted 76%HRmax of the pupils. At the same time, the average for the whole 30-minute lesson amounted to 142 beats/minute, which constituted only 71%HRmax. The highest average frequency of heart beats per minute was during the lesson of volleyball and was caused by the jump exercises which were introduced in the middle part of the lesson. The third part, both in the volleyball and in the floorball, was characterised by a low intensity and that was related to the simplified game in which the technical skills of the pupils and the organisation of the class did not allow for maintaining the high intensity. Only in the case of gymnastics, where the activities were conducted in the third part (unlike in the case of the volleyball and the floorball where in the third part there was a simplified game) also by the teacher, was it possible to maintain a similar level of intensity in comparison with the first and the second part. It seems that physical education teachers have a problem with the choice of the shaping intensity of the activities already at the level of planning (5 in the Borg scale, which corresponds to the activity intensity at the level of 150 beats/min – the physiological lower limit of the optimal exercise loads for children). The average value of the heart rate in the volleyball lesson – 150 beats per minute and in the gymnastics lesson – 144 beats per minute, is similar to the results obtained by other authors conducting a similar scope of research. In the study by Burton (1996) in the United States, the average value of the heart beats per minute among 9-12-year-old pupils exercising during a physical education lesson amounted to 142 beats per minute. On the other hand, in the research in France, conducted by Baquet et al. (2002), the intensity of a typical physical education lesson amounted to 134 beats per minute, which yields the result similar to the one obtained in the research presented in this work with reference to the floorball lesson. The level of intensity of the physical education lesson in the study by Gavarry et al (1998), conducted on a group of pupils aged 11-15 amounted to only 128 beats per minute. The intensity of the physical education lesson in the study by Perkowski in Polish schools (1998) was at the level of 149 beats per minute [Świerzko et al. 2014]. The level of intensity of a physical education lesson, as expressed by means of the heart beats per minute (HR) is still not adequate in terms of the biological and health effects of the process of school physical activity. It gains a particular importance in the times when children and youth perform any actions related to physical activity basically only during obligatory physical education classes. In the school physical education, the curriculum assumes a diagnosis of the agility, the physical activity and the physical development, at every level of the education. A nationwide – periodical (1999, 2009, 2012) evaluation of physical fitness of children and youth, realized by the National Centre for the Study of Physical Condition and the J. Piłsudski University of Physical Education in Warsaw confirms

the permanent process of decline in the physical fitness of our pupils, basically in all the parameters tested. In our opinion, one of the reasons for such a situation is a low level of intensity of physical education lessons. That is why, no curriculum modifications, no organizational or systemic modification will change much if the intensity of the physical education lesson is very low. Certainly, simple research activities of the palpatory heart rate assessment during the lesson are enough to have high probability data on the intensity of the physical education classes.

CONCLUSIONS

1. Physical education teachers have a problem with choosing appropriate intensity of classes for the given age of the children, compliant with the normative values.
2. The lowest intensity of the lesson with team games was noticed in the third part of the class, where the simplified game prevailed.
3. During the lessons, physical exertion in the interval of the heart rate constituting 90-100%HRmax were hardly existent.
4. Technical skills of the children, the choice of forms of physical activity and the appropriate organisation of the classes condition the possibility of maintaining the intensity of the classes.
5. In the main and the additional training of the physical education teachers, we should pay particular attention (practical) to the appropriate planning of classes in terms of assessing their intensity.

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