

PUPILS PHYSIOLOGICAL LOAD IN THE LESSON OF PHYSICAL EDUCATION IN THE COMBINED AND THE STANDARD CLASSROOMS

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Abstract

Combined classes are formed by merging several classes of different ages groups. The aim of this study was to determine whether there is a statistically significant difference in the physiological load in the PE lessons for pupils in combined classes compared to pupils in standard classes. For purposes of this study a sample of 174 pupils was collected. The sample of variables consisted of five heart-rate according to the parts of the lesson. Sample of pupils in the combined classes was compared with those in the standard classes from first to fourth grade in primary education. The results showed differences in the age group of first grade, in second grade there was no significant difference, while in the third and fourth grade differences were observed only in some parts of the PE lesson. This study has shown that despite so to say an attempt to equalize the implementation of the teaching process in combined and standard classes differences still exist.

Key words: load in the lecture; primary education; testing the differences

Introduction

Teaching is a well-planned part of an organized educational process which consists of a specific tasks and goals. According to Prskalo from 2004 teaching process is important for achieving the goals and tasks of physical education, it is complex process with its principles and direction, duration and structure. Important role in successful accomplishment of the educational process belongs to class structure and organization who in the end support the effects of teaching physical education.

The basic organizational form of teaching physical education is a class lesson provides a systematic and planned influence on the anthropological status of the pupils. Load in the PE depends on: the selection and order of exercises, intensity and frequency of exercises, tempo and rhythm of the exercises performed and the internal factors (pupils age, the number of students in the class, working conditions), as well as external factors (location and time in the day, air temperature, other atmospheric and climatic conditions, etc. (Findak, 2003). Studies has shown that implementation of appropriate methodical organizational work forms under the condition of preparedness for a specific work generate greater physiological load (Prskalo, 2002; Findak, Prskalo, Pejčić, 2003).

According to Bognar and Matijević from 2005 teaching process is organized labor process in mastering the prescribed content and the acquisition of knowledge, skills and habits as preparing pupils for further permanent work. The components of the educational system are: pupil, teacher, teaching content, working conditions (space and equipment), and relationships among class participants. Classes are held in schools, which are organized as an elementary school with its branch school. One elementary school may have a few of its branch school in which are usually performed classes from first to fourth grade and could be organized as the standard or combined classes, depending on the number of the pupils.

Teaching in primary schools takes place in classrooms and basically these are the standard classes. Number of students in one class varies from 14 to 28 pupils. In one standard classroom with pupils work one teacher. in that case load of physical education classes can be freely adapted to the class. Beside the standard classes sometimes there is a need for the combined classes that typically arise in regional schools with fewer students. Combination classrooms are classroom settings in which students at two grade levels learn and work together with one teacher. Combo classes could be arranged as two-grade, three-grade or even a four-grade combination. In combined classes is harder to work than in a standard classroom because the teacher has to devote to more grade pupils at the same time. In teaching PE occurs even bigger problem because usually it is about a relatively small schools who most often do not have a school sports hall. When most often two, sometimes three or four classes are working together at the same time practice comes to issues of diversity curriculum topics. Teachers usually organizes lessons in the way all the pupils work the same opening, preparatory, B-part and final part of a class and in the main A-part of the lesson they work in the specific organizational forms where every form group is performing tasks according to their age. All this could be very demanding, so some teachers decide for even the same lesson for all but in the higher or the lower level of performance.

The aim of this study was to determine whether there was a statistically significant difference in the physiological load of pupils in the PE lessons for the pupils in combined classrooms compared to pupils in the standard classrooms.

In accordance with the study, four null hypotheses are set. The first hypothesis is as follows: In PE classes first grade pupils at physiological load in combined classes will not be significantly different from those in the standard classes when performing identical instructional content. Second hypothesis is set as: In PE classes of the second grade pupils at physiological load in combined classes will not be significantly different from those in the standard classes when performing identical instructional content. The third hypothesis is: In PE classes of the third grade pupils at physiological load in combined classes will not be significantly different from those in the standard classes when performing identical instructional content. Last fourth hypothesis is set as: In PE classes of the fourth grade pupils at physiological in combined classes will not be significantly different from ones in the standard classes when performing identical instructional content.

Research methodology

Examinee sample. The sample was composed of the pupils from two primary schools which in its organization have a branch schools with combined classes-Elementary School “Great Trgovišće” with its local branch “Strmec” and elementary school “Krapinske Toplice” with its local branch “Gregurovec” and “Little Erpenja”. The study included a total of 174 pupils in lower grades of elementary school as shown in Table 1. All the pupils of the combined classes are included and the sample in the standard classes made up of an equal number of pupils as well as the combined class using a randomized sample.

Table 1: Number of examinee to the combined and standard classes according to the age

	Name of the school	Grade →	1.	2.	3.	4.	TOTAL
COMBINED CLASSES	“Veliko Trgovišće” – Strmec		7	10	8	6	31
	“Krapinske Toplice” – Gregurovec		5	7	9	6	27
	“Krapinske Toplice” – Mala Erpenja		9	10	6	4	29
STANDARD CLASSES	“Veliko Trgovišće”		7	10	8	6	31
	“Krapinske Toplice”		5	7	9	6	27
	“Krapinske Toplice”		9	10	6	4	29
	TOTAL		42	54	46	32	174

Variables sample. Variables sample consisted of five heart rates as shown in Table 2. Heart rates were measured in all five parts of the lesson. Based on the collected frequency averaged hart rate was calculated for all parts of the lesson.

Table 2: Variables sample

Term	Abbreviation	Mesure unit
Heart rate in the opening part of a lesson	FsO	The number of repetition
Heart rate in the preparatory part of a lesson	FsP	
Heart rate in the main A part of a lesson	FsA	
Heart rate in the B part of a lesson	FsB	
Heart rate in the final part of a lesson	FsF	

Data analyses. Data were collected during regular PE classes. 3rd grade and 4th grade pupils were measured hart-rate for themselves, while the adults instructed examiners were measured hart-rate for pupils in 1st and 2nd grade. In each class, the class hart-rate was measured twice to cover the total number of students and verify the authenticity of the information. The collected data are processed by basic descriptive statistics and Kolmogorov-Smirnov test (KS test) was made to test the normality. For statistical analysis of the data, the statistical program “Statistica 10” was used and in the finaly Student’s t-test was applied for differences between groups at the level of significance of 95% ($p < 0.05$).

Specific curriculums were planned for the each lesson. The following Table 3. displayed briefly preparation for the lessons used in classes that participated in this study.

Table 3: Used lesson plans

Lesson parts	first grade	second grade	third grade	fourth grade
Opening	Running with the tasks			
Ppreparatory	General preparatory exercise with hoops			
Main A	1. Forward roll down the slope 2. Skipping a short rope in place	1. Forward roll 2. Skipping a short rope in motion	1. Pulling and suppression partner in different ways without aids 2. Cyclic movement of a different pace up to 3 minutes 3. "Children" jumps	1. Connecting roll forward and roll backwards 2. Speed run up to 50 m from the semi-high start 3. Dance
Main B	Obstacle course			
Final	Faking ball			

Results and Discussion

The results are shown by the table to subsamples defined by the grade. Table 4 presents the basic descriptive indicators for certain grade relating to standard and combined classes.

Tablica 4: Basic descriptive statistic for 1st to 4th grade pupils in combined and standard classes

		N	M	Min	Max	SD	Skew	Kurt	Max D	K-S test
FIRST GRADE										
combined classes	FsO	21	121,19	80	153	20,24	-0,30	-0,96	0.22	p>.20
	FsP	21	114,90	102	146	10,85	1,26	2,07	0.17	p>.20
	FsA	21	127,05	91	142	12,33	-1,15	2,17	0.14	p>.20
	FsB	21	137,81	79	158	15,99	-2,60	9,16	0.12	p>.20
	FsF	21	99,72	84	114	7,93	-0,44	-0,38	0.18	p>.20
standard classes	FsO	21	101,57	69	137	15,19	0,54	1,73	0.17	p>.20
	FsP	21	99,24	65	146	18,06	0,22	1,65	0.17	p>.20
	FsA	21	111,14	69	130	14,58	-1,25	2,17	0.16	p>.20
	FsB	21	121,24	68	158	21,47	-1,15	1,40	0.16	p>.20
	FsF	21	88,48	62	107	13,63	-0,55	-0,79	0.16	p>.20
SECOND GRADE										
combined classes	FsO	27	100,85	75	127	11,59	-0,36	0,79	0.14	p>.20
	FsP	27	110,70	89	133	12,27	0,29	-0,86	0.11	p>.20
	FsA	27	120,96	102	151	12,92	0,76	-0,8	0.17	p>.20
	FsB	27	141,19	105	170	1,61	-0,25	-0,29	0.09	p>.20
	FsF	27	100,48	81	129	10,60	0,44	0,91	0.11	p>.20
standard classes	FsO	27	105,74	84	130	12,36	0,09	-0,72	0.13	p>.20
	FsP	27	110,96	100	130	9,26	0,75	-0,75	0.15	p>.20
	FsA	27	123,44	94	153	13	0,28	0,61	0.14	p>.20
	FsB	27	136,07	100	164	16,41	0,01	-0,38	0.10	p>.20
	FsF	27	97,00	61	115	13,11	-0,59	0,53	0.9	p>.20
THIRD GRADE										
combined classes	FsO	23	117,91	90	151	17,96	0,48	-0,74	0.15	p>.20
	FsP	23	112,22	84	139	14,59	0,07	-0,98	0.14	p>.20
	FsA	23	128,43	86	166	18,77	-0,64	0,97	0.14	p>.20
	FsB	23	144,91	120	180	15,35	0,43	-0,14	0.14	p>.20
	FsF	23	96,70	76	121	10,07	0,14	0,69	0.14	p>.20
standard classes	FsO	23	104,74	85	124	12,03	-0,17	-1,22	0.13	p>.20
	FsP	23	113,96	93	127	9,21	-0,61	-0,42	0.11	p>.20
	FsA	23	126,17	100	142	9,93	-0,69	0,81	0.10	p>.20
	FsB	23	140,22	121	159	10,64	0,22	-0,67	0.08	p>.20
	FsF	23	102,87	82	119	9,60	-0,76	0,07	0.15	p>.20

FOURTH GRADE										
combined classes	FsO	16	116,94	102	160	15,59	1,77	3,12	0,21	p>.20
	FsP	16	112,18	90	132	15,72	-0,07	-1,76	0,15	p>.20
	FsA	16	134,69	114	161	15,34	0,14	-1,17	0,13	p>.20
	FsB	16	138,19	100	163	18,47	-0,95	0,56	0,16	p>.20
	FsF	16	94,00	82	103	6,59	-0,22	-1,10	0,12	p>.20
standard classes	FsO	16	101,75	87	127	10,51	1,01	1,11	0,17	p>.20
	FsP	16	105,88	90	130	11,82	0,61	-0,62	0,18	p>.20
	FsA	16	117,81	102	133	7,93	-0,42	0,36	0,18	p>.20
	FsB	16	128,56	112	148	10,97	-0,09	-0,91	0,14	p>.20
	FsF	16	93,88	80	109	9,45	0,12	-1,10	0,11	p>.20

Legend: number of subjects (N), mean (M), the minimum value (Min), maximum value (Max.) standard deviation (SD), coefficient of skewness (Skew), coefficient of curvature (Kurt), Kolmogorov-Smirnov test (KS test), FsO-heart rate in the opening part of a lesson, FsP-heart rate in the preparatory part of a lesson, FsA-heart rate in the main A part of a lesson, FsB-heart rate in the B part of a lesson, FsF-heart rate in the final part of a lesson

Data were tested with Kolmogorov-Smirnov test which showed that the results are subject to normal distribution in all grades in all combo and all the standard classes.

Table 5. Determining the difference in between the combined and the standard classes by grades with t-test at the significance level of 95% ($p < 0.05$)

grade	FsO		FsP		FsA		FsB		FsF	
	t-test	p	t-test	p	t-test	p	t-test	p	t-test	p
1 st	4,15*	0,0002	3,41*	0,0015	4,38*	0,0001	3,90*	0,0004	3,27*	0,0022
2 nd	-1,50	0,1398	-0,09	0,9305	-0,70	0,4848	1,10	0,2750	1,07	0,2884
3 rd	2,92*	0,0054	-0,48	0,6310	0,51	0,6122	1,20	0,2344	-2,13*	0,0389
4 th	3,23*	0,0029	1,28	0,2089	3,91*	0,0004	1,79	0,0832	0,04	0,9656

Legend: FsO-heart rate in the opening part of a lesson, FsP-heart rate in the preparatory part of a lesson, FsA-heart rate in the main A part of a lesson, FsB-heart rate in the B part of a lesson, FsF-heart rate in the final part of a lesson

Student's t-test at significance level of 95% ($p < 0.05$) was made to determine the differences as shown in Table 5. In the first grade it has been proved statistically significant difference in all stages of the lesson: opening part ($p < 0.0002$), preparatory part ($p < 0.0015$), main A part of the lesson ($p < 0.0001$), B-part ($p < 0,0004$) and final part ($p < 0.0022$). Therefore, according to the results first set of hypotheses has been rejected – there are no statistically significant differences in the physiological load on teaching PE to first grade pupils in combined classes in relation to those in the standard classes.

Applying the t-test to second grade classes it could be seen that there is no statistically significant difference between the pupils in the combined and standard classes in any stage of teaching: an opening part ($p < 0.1398$), preparatory part ($p < 0.9305$), A-part ($p < 0.4848$), B-part ($p < 0.2750$), and the final part ($p < 0.2884$). So the second null hypothesis has been accepted - there are no differences between the physiological load of pupils who attend combined classes and those who attend standard classes in the second grade of primary schools.

Statistical analysis of the heart-rate data during PE lessons in the third grade in the combined and standard classes indicate the results of existence statistical significance difference in the opening part ($p < 0.0054$) and in the final part of the lessons ($p < 0.0389$). The other three parts of the lessons did not show statistical significance: the preparatory part ($p < 0.6310$), the main A-part ($p < 0.6122$), the B-part ($p < 0.2344$). Therefore, the third hypothesis was partially accepted.

In fourth grade also has been observed a significant difference in the opening ($p < 0.0029$), but in this age group it has been noted significant difference in the main A-part of the lesson ($p < 0.0004$). In the rest of the lesson there were no difference: the preparatory part ($p < 0.2089$), the main B-part ($p < 0.0832$) and the final part ($p < 0.9656$). The fourth hypothesis was also partially accepted - as a physiological load in the PE lessons does not distinguish between standard and combined classes in the fourth grade.

Physiological load is precondition for desirable transformation process specifically in childhood when it leaves significant consequences and affects the harmonious growth and development. This is especially important in preparing today's pupils for life in circumstances where movement is marginalized. Contemporarily understanding of successfulness is less linked to motor behaviour and more on an intellectual level. Modern living conditions caused by stressful situation has been noticed already in children and depression becomes the everyday life of modern man. Fatigue, in the labour population, is associated with psychological consequences (Bultmann et al., 2002).

Conclusion

Based on data collected in the PE classes about physiological load to pupils in the combined classes and their comparison with those in the standard classes, it needs to be said, for the final conclusion it should conduct further research on larger and more representative samples.

This research has shown that the majority of students resulted with high-frequency heart rate at a given load. Pursuant to the hypotheses, the first hypothesis, which says that there is no statistically significant differences in the physiological load on teaching physical education to pupils in combined classes and those in standard classes was rejected. Based on the obtained results and the absence of differences in the physiological load during physical education lessons the second hypothesis was accepted. The third hypothesis of no statistically significant differences in the physiological load on teaching physical education to pupils in the third grade in between the combined and standard classes was partially accepted due to lack of difference between the three of the five measured variables. Similar results were also obtained in the fourth grade, so the fourth hypothesis was also partially accepted. Statistically significant difference in all parts of the PE lessons was obtained only in the first grade and it can be explained by the transition from kindergarten to school, and in the first grade it is still ongoing process of adjustment. The results obtained are in favour of teachers who demonstrate a satisfactory level of preparation and good work with children, considering that the work in combined classes among teacher's population is not popular and requires greater efforts in planning and teaching by teachers. For more quality planning of teaching process for the teacher is extremely important feedback on the current state of pupils and their transformation process during the school year what leads to a clear space for diagnostic in the teaching process, which can easily be implemented by measuring the heart rate.

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