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THE EFFECTS OF DIFFERENT ORGANIZING MODELS OF THE PHYSICAL EDUCATION CLASSES IN SECONDARY SCHOOL

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Abstract

A 14-week experiment was conducted on a sample of 48 subjects (25 boys) aged 18.5 years (±6 months) aimed to check the impact of two specific models of physical education classes to motor abilities, attitudes towards physical education and the active workout time. Three groups were formed and each had a different treatment. In the first experimental group (9 boys and 8 girls), one standard class of physical education (PE) was replaced by one lesson of theoretical teaching. The second experimental group (8 boys and 7 girls) had two physical education classes in the opposite shift, which were extended from the standard 45 to 60 minutes and different modern fitness programs were applied to them. The control group (8 boys and 8 girls) had a normal school schedule and two standard PE per week. The effects of the treatments were evaluated by comparing the numerical data from the pre-test and post-test. The results of the statistical analysis revealed that the groups at the beginning of the experiment were homogeneous (not differ in any variable). In both experimental groups, more positive attitudes towards PE were formed during the experiment. A significant improvement in motor abilities was achieved only in the second experimental group that had extended classes in the opposite shift. At the same time, there were no statistically significant changes in any variable in the control group. The longest active workout time achieved in the second experimental group when elements of modern fitness programs used.

Key words: MOTOR ABILITIES / EUROFIT TESTS / STUDENT ATTITUDES / PEAS QUESTIONNAIRE / ACTIVE WORKOUT TIME / SOFIT

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INTRODUCTION

What makes a good high school physical education class? Are they good curricula, well-organized teaching technology, or are they just good teachers? Objective criteria are difficult to determine because the assessment of the quality of the educational process is very subjective. The most common criterion for evaluation is the effects of education (knowledge outcomes). According to the official curriculum for secondary schools, the subject of physical education (PE) in the Republic of Serbia is compulsory and it is represented by two classes of 45 minutes per week. This plan, as the main outcomes of FV foresees, among other things, that students know how to develop motor abilities, learn different sports skills, improve functional abilities, acquire theoretical information important for understanding the role of physical activity (PA) in prevention and health preservation, then to form healthy habits and build a positive attitude towards exercise, and in addition to all that, learn how to assess their motor and physical status (SSPFVS, 2023). The stated outcomes are very ambitious and difficult to achieve in practice. In a review, Maksić (2000) analyses the results of previous studies and notes the discouraging fact that in Serbia "the set aims are not fully realized, often to an unsatisfactory extent. Analyses of teaching effects reveal that students mostly acquire knowledge at the level of reproduction, significantly less at the level of understanding, while the ability to apply knowledge is the weakest" (p. 734). These observations are corroborated by Rodić (2002) stating that "physical education in schools is reduced to the acquisition of motor stereotypes and the acquisition of skills that the student cannot or does not know how to use in life" (p. 303).

A sedentary lifestyle is dominant in all modern societies, and numerous studies link it to the rise of chronic non-communicable diseases, primarily obesity (Atrokey et al., 2019; Kandola et al., 2020; Uddin et al., 2020). Decreased PA is especially noticeable during adolescence (15-19 years), which places high school students in a risk group (Wallace et al., 2000). According to the recommendation of the World Health Organization (WHO, 2014), children and adolescents should achieve a minimum of 60 minutes of daily moderate to vigorous physical activity. Within the world population, only 20% of adolescents carry out this recommendation (Hallal et al., 2012; Hollis et al., 2016). The reason for this is, among other things, that physical education in most countries is represented only by 2-3 school classes per week and for most children (about 85% of students) it is the only form of physical activity (Hardman et al., 2007). Children spend most of their time at school and therefore the school has a great responsibility for their health. Professional organizations around the world, including the European Association for Physical Education (EUPEA, 2021), are advocating for the maximum increase in physical education classes, i.e. for children to exercise 60 minutes a day in schools.

The aim of this research is to valorise the effects of two experimental (innovative) models of organizing FV teaching in secondary schools, which are assumed to be more effective than the PE models currently used in R. Serbia. Increasing the number of PE classes is very difficult to achieve in real practice, given the material (personnel and space) limitations faced by most schools, as well as the complex procedure of obtaining permission from the school authorities to change the official curriculum. That's why in this research, only two interventions were applied that could be implemented within the two weekly lessons of FV provided by the official plan of the Ministry of Education. The first involve the application of one compulsory lesson of theoretical teaching which was implemented within the existing (standard) class fund, while the second involve PE teaching in the opposite shift with two 60-minute lessons per week. Within the extended classes, it was possible to devote more time to active practice instead of learning sports technique. On this manner it was possible to devote more time to practice instead of learning sports technique within the extended classes. The structure of these classes is similar to sports and recreational training; they, to a greater extent, used modern tools that can be applied in all spatial circumstances, and they emphasized the development of students' basic motor and functional abilities. Permits were previously obtained from the school authorities responsible for the territory of Kosovska Mitrovica for these changes, and the permission of the school administration (Teacher's Council and Parents' Council) was obtained.

The need to examine the effects of organizing models PE different of the classical PE classes usually applied, stemmed from findings of previous research that show secondary school students in Serbia effectively practice less than 50% of the PE class time (Kostić et al., 2020; Marković et al., 2012), which is the minimum recommended in the professional literature for fulfilling the key outcomes of the school PE (Hallal et al., 2012; Hollis et al., 2016; WHO, 2014). The application of theoretical teaching can be one of the ways to increase the quality of PE in secondary schools. The assumption that started when designing this research was that through theory classes, students can gain more knowledge about the values of regular PA, form a more positive attitude towards exercise and get practical information about what, how and how much to exercise extra outside of school. The results of previous research (Digelidis et al., 2003; Kelso et al., 2020; Pacala et al., 2017; Quinn et al., 2008) indicate the importance of education for acquiring practical knowledge about exercise and health. The mentioned studies report that education had the greatest effect on increasing the motivation for regular exercise. Students who participated in these educational interventions, compared to their other peers, had more positive attitudes towards exercise and healthy eating, less pronounced ego and greater orientation towards the tasks of the school PE.

METHOD

Study design

This is an experimental research with non-probability sampling during which changes in motor skills and attitudes of high school students towards PE were monitored. The experiment lasted 14 weeks and was implemented during 2023/24. school year, under the guidance of a physical education professor, and with the assistance of fourth-year students of the Faculty of sports and physical education of the University of Priština with a temporary stay in Leposavić.

The PE program for high schools in the Republic of Serbia envisages two basic groups of teaching content: sports and technical education and sports games (ball games). Sports and technical education is common to all students and includes the application of content from athletics and gymnastics (exercises on the equipment and the floor). Sports games are implemented as optional content and the school's teaching council determines the sports that students can choose. In the school where this research was conducted, optional sports are basketball and volleyball.

The first experimental group (E1) had two regular PE classes per week integrated into the school's schedule. One of which was used for theoretical teaching in the classroom, while the other was used by students to practice in the hall or on open sports fields. The first experimental group (E1) had two regular PE classes per week integrated into the school's schedule, one of which was used for theoretical teaching in the classroom, while the other was used by students to practice in the gym or at the outdoor sports ground. This theory lesson, as a rule, was realized instead of the lessons scheduled for sports games. The manual for physical and health education (Perić et al., 2019) approved by the Republic Institute for the Improvement of Training and Education as an additional teaching tool in primary and secondary schools (decision no. 972-3/2018) was the basis for the theoretical teaching preparing. The second experimental group (E2) had two two-hour sessions a week lasting 60 minutes each, in the opposite shift. The structure of these classes is closer to sports and recreational trainings; to a greater extent, they used elements of modern group fitness programs, and they emphasized the development of basic motor abilities. The control group (K) during the same period (14 weeks) had two regular PE lessons per week in accordance with the school curriculum. In one lesson, content from athletics or gymnastics was used, and in the other, elements of the selected sports game (basketball and volleyball) were used.

Measuring the volume and intensity of PA in individual classes with different teaching units was organized to compare the active time in the PE class. Data on active workout time were collected for the next seven teaching units: athletics (long jump), gymnastics (vault), basketball (dribbling, pick and roll), volleyball (serving and service reception), Cross-Fit, Circular Workout and Skill Polygon.

Before and after the experimental treatment, through the initial (pre-test) and final (post-test) measurements, data were collected on the same variables using standardized instruments under the same conditions. The participants first filled out a questionnaire for attitudes assessing towards PE, after which the EUROFIT battery of tests for the assessment of basic motor skills carried out. The subjects performed all the tests in appropriate sports equipment. The entire testing of one subject was completed in one day and took about 60 minutes. All measurements were carried out by trained measurers and with this dynamic they tested 24-30 subjects per day, so the complete collection of empirical material lasted for five days at the initial and final measurements. Each protocol was explained in detail before the testing. The subjects gave their written consent to participate in the research. All procedures were carried out in accordance with the provisions of the Declaration of Helsinki on working with people (WMA, 2018).

Sample

The sample was formed from students of the general gymnasium in Kosovska Mitrovica, where the author of the paper carries out pedagogical practice with students of the Faculty of Sports and Physical Education. A controlled group sample was used in the work. Each group (E1, E2, K) consisted of one pre-selected fourth grade class. The average age of the respondents was 18.5 years (±6 months). Each class consisted of 20-22 students and everybody were included in the experimental treatment and testing. However, only students with complete data were included in the final sample, where the basic elimination criterion was that during the experimental period, the subjects actively participated in a minimum of 90% of the classes held (25 of 28 total classes). The sample does not include student-athletes who regularly practice and compete in a sports club. In this way, the uncontrollable factors impact that operate in every out-of-laboratory experiment is reduced. The sample included students of both gender (boys and girls), considering that they participated equally in all PE classes during the experimental period. The final sample was formed by applying the described selection criteria (complete results of all tests and active participation in at least 90% of the classes held) and it included 48 respondents (25 boys and 23 girls) distributed as follows: group E1 - 17 subjects (9 boys and 8 girls), group E2 - 15 subjects (8 boys and 7 girls) and group K - 16 subjects (8 boys and 8 girls).

Materials and instruments

EUROFIT is a battery of tests used to assess motor abilities. It was born from the need of physical education teachers and sports coaches to control and monitor the physical development of children aged 7-19. The first version was published in the form of an experimental manual (Council of Europe, 1983), and was later supplemented and standardized (Adam et al., 1993). The eight motor tasks (tests) that make up EUROFIT are performed in the following order: (1) Flamingo Balance Test, (2) Plate Tapping (the speed test of performing repetitive movements), (3) Sit and Reach (flexibility test), (4) Standing Long Jump (test of leg explosive power), (5) Hand Grip, (6) Sit Ups (test of trunk flexors strength), (7) Bent Arm Hang (test of arms flexors strength) and (8) Shuttle Run 10 x 5m (test of speed endurance and agility).

The PEAS instrument (Physical Education Attitude Scale) which constructed and standardized Orlić et al. (2017) on the adolescent population, was used to assess attitudes towards PE. The authors and 50 master's students of the Faculty of sports and physical education generated 124 initial items during professional practice in secondary schools. After eliminating duplicate and ambiguous items, a factor analysis was conducted and only 43 items were retained in the final version of the questionnaire. Four stable components (factors) were extracted from these items, which explain 48% of the total variance. The factors are named: (1) Satisfaction (12 items), (2) Comfort (12 items), (3) Activity (11 items) and (4) Teacher (8 items). A five-level Likert technique is used to indicate the attitude towards each of the 43 statements, while giving the answer as quickly as possible. The responses were formulated as follows: 1) Strongly disagree, 2) Disagree, 3) Undecided, 4) Agree and 5) Strongly agree. The response most favourable to PA received a score of five, while the least favourable response received a score of one. Some items are formulated positively and some negatively, so before final calculating, it was necessary to perform an inversion

(recoding) of negative statements. The recoding way was as follows: 1→5, 2→4, 4→2 and 5→1. The final score for each of the four PEAS sub-scales is the average calculated from the corresponding items.

The data of the active workout of students in the FV class was registered using the SOFIT (System for Observing Fitness Instruction Time) instrument constructed by McKenzie et al. (1991). It was often used in previous pedagogical studies (Kostić et al., 2020; McKenzie & Smith, 2017; McNamee & van der Mars, 2005; Marković et al., 2012; Powel et al., 2016; Smith et al., 2019). It was originally designed as a diagnostic instrument intended for PE teachers to control class workload, and was later modified and adapted for research purposes. The latest version of this instrument described in the manual available on the Internet (McKenzie, 2017) was used in this research. Trained observers (students of the faculty of sports and physical education on pedagogical practice) collected data by direct observation of classes. In group E1, active time was measured in the lessons when the teaching units of athletics and gymnastics were covered. In the E2 group, active time was measured in classes that used Cross-Fit, Circular Workout and Skill Polygon. In the control group, the active time was measured in the classes when basketball and volleyball elements were covered. The measurement results are expressed as relative values (percentages) in relation to the total lesson time (in E1 and K in relation to 45, and in E2 in relation to 60 minutes).

Statistical analysis

Arithmetic mean (Mean) and standard deviation (SD) were calculated for each variable before and after the experiment (pre-test and post-test). Relationships between variables were analysed using inferential statistics (two-way and mixed ANOVA). The differences between arithmetic means under the influence of gender and specific group (E1, E2, K) was tested before the experiment (pre-test) and aimed to check the groups' homogeneity. Two-way ANOVA was used for this testing.

The effects of the experimental treatments were evaluated by comparing the mean values of the initial and final measurements (pre-test and post-test) obtained for each variable in relation to the treatments of the three groups (E1, E2, K). The significance of the differences between the Mean values obtained under the influence of treatment and groups was tested by a combined analysis of variance, which in the literature is called Mixed between-within subjects ANOVA (Tabachnick & Fidell, 2019). Two factors (two independent variables) were combined: the action time of the experimental factor (within-group variability) and the treatment specificity of the three groups (between-group variability). A mixed 2 x 3 design (a matrix with two time points and three groups) was applied for the comparison of data from different time points (pre-test and post-test). The actual influence of independent variables (treatment and group), both joint (interaction of factors) and separate, was estimated using Partial Eta Squared (η^2), based on the criteria proposed by Cohen (1988). A mixed ANOVA was conducted separately for the motor variables of boys and girls, and for attitudes on the complete sample.

Before applying any ANOVA model, Levene's test was used to check the assumption of equality of variances of independent variables in different sub-groups, which is a basic prerequisite for valid interpretation of ANOVA results (Pallant, 2020). As part of the analysis of variance, the power of the statistical test (Observed Power) was calculated. A Post Hoc analysis by using the Tukey HSD criterion was conducted for a more detailed discovery of the sources of the variability between groups. All statistical analyses were performed by using IBM SPSS v.21 software package (License Stats Prem: 761b17dcfd1bf20da576 by Hearne software), and statistical significance was set at $p < 0.05$.

RESULTS

The results of the pre-test showed that the groups were very homogeneous considering the fact that no statistically significant differences were obtained between the Means of groups E1, E2 and K. At the same time, statistically significant differences between participants of different gender were found before the experiment for the majority of motor variables. The influence of gender was absent only in the balance test (Flamingo) and the speed test of repetitive movements (Plate Tapping). The influence of gender was found to

be significant in all strength tests (Standing long jump, Hand grip, Sit ups, Bent arm hang), and then also in the tests of flexibility (Sit and reach) and speed endurance (Shuttle run 10 x 5m). Boys had statistically better results in all tests of strength and agility, while girls were better only in flexibility (Table 1). Because of these differences, the effects of the experimental treatments were analysed separately for boys and girls. The attitudes of boys and girls towards FV did not differ significantly in the pre-test, so the influence of experimental treatments on four sub-scales (satisfaction, comfort, activity and teacher) was analysed with the complete sample. Levene's test showed that the variances of the independent variables in all eight EUROFUT tests, as well as all 4 sub-scales of the PEAS questionnaire, were uniform, which fulfilled the basic assumption for the application of ANOVA.

Table 1. Indicators of the influence of gender and group on motor abilities measured before the experimental treatment

Variable	*Impact*	F	p	η2	Achieved Power
Flamingo Balance Test	Interaction	0.010	0.990	<0.001	0.051
	Gender	0.056	0.814	0.001	0.056
	Group	0.003	0.997	<0.001	0.050
Plate Tapping	Interaction	0.011	0.989	0.001	0.052
	Gender	0.220	0.642	0.005	0.074
	Group	0.014	0.987	0.001	0.052
Sit and Reach	Interaction	0.046	0.955	0.002	0.056
	Gender	9.744	0.003	0.188	0.862
	Group	0.044	0.957	0.002	0.056
Standing Long Jump	Interaction	0.009	0.991	<0.001	0.051
	Gender	27.017	<0.001	0.391	0.999
	Group	0.003	0.997	<0.001	0.050
Hand Grip	Interaction	0.049	0.952	0.002	0.057
	Gender	42.552	<0.001	0.503	1.000
	Group	0.003	0.997	<0.001	0.050
Sit Ups	Interaction	0.014	.986	0.001	0.052
	Gender	19.335	<0.001	0.315	0.990
	Group	0.008	0.992	<0.001	0.051
Bent Arm Hang	Interaction	0.008	0.992	<0.001	0.051
	Gender	170.471	<0.001	0.802	1.000
	Group	0.001	0.999	<0.001	0.050
Shuttle Run 10x5m	Interaction	0.007	0.993	<0.001	0.051
	Gender	74.220	<0.001	0.639	1.000
	Group	0.014	0.986	0.001	0.052

Legend: F = ANOVA parameter; **p** = Level of significance; η^2 = Partial Eta Squared (Effect Size)

Descriptive data on motor variables from the initial and final measurements for boys are shown in Tables 2 and 3, and for girls in Tables 4 and 5. The average scores of all tests increased during the experimental period in all three groups (E1, E2 and K), but all these changes were not statistically significant. Post Hoc analysis revealed that statistically significant progress was achieved only in group E2, while the changes of the remaining two groups (E1 and K) were probably due to biological growth and development. The greatest progress under the influence of the experimental treatment was achieved in the following five tests: Flamingo balance test, Standing long jump, Sit ups, Bent arm hang and Shuttle run 10 x 5m. In all five cases, a significant interaction of factors and a significant separate influence of treatment were recorded, while the influence of group specificity was negligible. In the Hand grip test, there were also positive changes, but they were much less pronounced, as indicated by the absence of factor interaction. For the remaining two motor tests, Plate tapping and Sit and reach, no statistically significant changes were found in either boys or girls during the experimental period.

Table 2. Descriptive data of the EUROFIT tests for boys at the initial and final measurements

			Initial measurement		Final measurement	
Test	*Group*	N	*Mean*	SD	*Mean*	SD
FBT (s)	Experimental 1	9	**3.80**	0.72	**3.95**	0.75
	Experimental 2	8	**3.84**	0.76	**4.06**	0.78
	Control	8	**3.83**	0.75	**3.94**	0.75
Tap (s)	Experimental 1	9	**9.79**	0.75	**9.74**	0.72
	Experimental 2	8	**9.83**	0.79	**9.79**	0.69
	Control	8	**9.84**	0.82	**9.83**	0.77
S-R (cm)	Experimental 1	9	**22.33**	3.71	**22.78**	3.83

	Experimental 2	8	**22.25**	3.95	**22.50**	3.51
	Control	8	**22.13**	3.91	**22.25**	3.28
SLJ (cm)	Experimental 1	9	**206.33**	16.23	**206.56**	17.35
	Experimental 2	8	**205.88**	17.29	**210.63**	17.06
	Control	8	**206.13**	17.12	**206.63**	16.77
HG (kg)	Experimental 1	9	**40.89**	3.18	**41.67**	2.83
	Experimental 2	8	**41.00**	3.38	**42.63**	3.85
	Control	8	**40.50**	4.11	**41.38**	3.54
S-U (No)	Experimental 1	9	**30.78**	3.19	**31.56**	2.96
	Experimental 2	8	**30.50**	3.29	**32.75**	3.19
	Control	8	**30.63**	3.25	**31.00**	2.93
BAH (s)	Experimental 1	9	**33.11**	3.48	**34.78**	3.65
	Experimental 2	8	**33.00**	3.70	**35.81**	3.71
	Control	8	**33.13**	3.68	**34.73**	3.90
SR10x5 (s)	Experimental 1	9	**19.30**	0.46	**18.15**	0.44
	Experimental 2	8	**19.29**	0.49	**17.79**	0.59
	Control	8	**19.32**	0.50	**18.13**	0.46

Legend: FBT = Flamingo Balance Test; Tap = Plate Tapping; S-R = Sit and Reach; SBJ = Standing Long Jump; HG = Hand Grip; S-U = Sit Ups; BAH = Bent Arm Hang; SR10x5 = Shuttle Run 10 x 5m; N = Participants number; *Mean* = Arithmetical mean; SD = Standard Deviation

Table 3. The Mixed ANOVA results related to the motor abilities of boys from Table 2

Impact	Wilks' Lambda	F	**p**	η^2	Observed power
FBT					
Factor interaction	0.427	14.743	<0.001	0.573	0.997
Treatment	0.060	346.828	<0.001	0.940	1.000
Group	/	0.021	0.979	0.002	0.053
Tap					
Factor interaction	0.990	0.110	0.897	0.010	0.065
Treatment	0.950	1.157	0.294	0.050	0.177
Group	/	0.016	0.984	0.001	0.052
S-R					
Factor interaction	0.986	0.159	0.854	0.014	0.072
Treatment	0.943	1.337	0.260	0.057	0.198
Group	/	0.021	0.979	0.002	0.053
SLJ					
Factor interaction	0.526	9.915	0.001	0.474	0.968
Treatment	0.585	15.585	0.001	0.415	0.965
Group	/	0.032	0.968	0.003	0.054
HG					
Factor interaction	0.882	1.478	0.250	0.118	0.281
Treatment	0.469	24.882	<0.001	0.531	0.997
Group	/	0.131	0.877	0.012	0.068
S-U					
Factor interaction	0.487	11.574	<0.001	0.513	0.985
Treatment	0.318	47.247	<0.001	0.682	1.000
Group	/	0.137	0.872	0.012	0.069
BAH					
Factor interaction	0.160	57.824	<0.001	0.840	1.000
Treatment	0.014	1546.044	<0.001	0.986	1.000
Group	/	0.045	0.956	0.004	0.056
SR10x5					
Factor interaction	0.393	16.975	<0.001	0.607	0.999
Treatment	0.009	2294.136	<0.001	0.991	1.000
Group	/	0.390	0.682	0.034	0.105

Legend: FBT = Flamingo Balance Test; Tap = Plate Tapping; S-R = Sit and Reach; SBJ = Standing Long Jump; HG = Hand Grip; S-U = Sit Ups; BAH = Bent Arm Hang; SR10x5 = Shuttle Run 10 x 5m; **p** = Significance level; η^2 = Partial Eta Squared (Effect Size)

Table 4. *Descriptive data of the EUROFIT tests for girls at the initial and final measurements*

			Initial measurement		Final measurement	
Test	*Group*	N	*Mean*	SD	*Mean*	SD
FBT (s)	Experimental 1	8	**3.90**	0.87	**4.05**	0.90
	Experimental 2	7	**3.85**	0.93	**4.04**	0.95
	Control	8	**3.89**	0.86	**3.99**	0.86
Tap (s)	Experimental 1	8	**9.91**	0.84	**9.90**	0.87
	Experimental 2	7	**9.97**	0.89	**9.96**	0.95
	Control	8	**9.90**	0.82	**9.81**	0.89
S-R (cm)	Experimental 1	8	**25.75**	4.71	**26.00**	4.34
	Experimental 2	7	**26.57**	4.43	**26.86**	4.45
	Control	8	**25.88**	4.70	**25.63**	4.84
SLJ (cm)	Experimental 1	8	**183.38**	12.36	**184.63**	12.86
	Experimental 2	7	**184.14**	13.15	**191.57**	10.03
	Control	8	**183.13**	12.46	**184.75**	12.58
HG (kg)	Experimental 1	8	**32.00**	5.45	**32.75**	5.15
	Experimental 2	7	**32.14**	5.87	**34.00**	5.80

	Control	8	**32.50**	4.99	**32.52**	5.18
S-U (No)	Experimental 1	8	**26.50**	3.21	**27.50**	3.25
	Experimental 2	7	**26.57**	3.46	**28.57**	3.15
	Control	8	**26.38**	3.20	**27.00**	3.29
BAH (s)	Experimental 1	8	**22.31**	2.62	**22.40**	2.62
	Experimental 2	7	**24.43**	2.74	**24.55**	2.75
	Control	8	**22.30**	2.62	**22.33**	2.62
SR10x5 (s)	Experimental 1	8	**21.43**	1.08	**20.15**	1.01
	Experimental 2	7	**21.35**	1.14	**19.81**	1.09
	Control	8	**21.41**	1.09	**20.25**	1.02

Legend: FBT = Flamingo Balance Test; Tap = Plate Tapping; S-R = Sit and Reach; SBJ = Standing Long Jump; HG = Hand Grip; S-U = Sit Ups; BAH = Bent Arm Hang; SR10x5 = Shuttle Run 10 x 5m; N = Participants number; Mean = Arithmetical mean; SD = Standard Deviation

Table 5. The Mixed ANOVA results related to the motor abilities of girls from Table 4

Impact	Wilks' Lambda	F	**p**	η^2	Observed power
FBT					
Factor interaction	0.630	5.884	0.010	0.370	0.819
Treatment	0.089	204.349	<0.001	0.911	1.000
Group	/	0.003	0.997	<0.001	0.050
Tap					
Factor interaction	0.896	1.166	0.332	0.104	0.226
Treatment	0.921	1.711	0.206	0.079	0.238
Group	/	0.032	0.968	0.003	0.054
S-R					
Factor interaction	0.959	0.431	0.656	0.041	0.110
Treatment	0.994	0.128	0.724	0.006	0.063
Group	/	0.097	0.908	0.010	0.063
SLJ					
Factor interaction	0.449	12.254	<0.001	0.551	0.989
Treatment	0.346	37.771	<0.001	0.654	1.000
Group	/	0.246	0.784	0.024	0.083
HG					
Factor interaction	0.653	05.316	0.014	0.347	0.776
Treatment	0.585	14.207	0.001	0.415	0.948
Group	/	0.035	0.966	0.003	0.055
S-U					
Factor interaction	0.615	6.256	0.008	0.385	0.843
Treatment	0.262	56.335	<0.001	0.738	1.000
Group	/	0.142	0.869	0.014	0.069
BAH					
Factor interaction	0.158	53.401	<0.001	0.842	1.000
Treatment	0.048	397.510	<0.001	0.952	1.000
Group	/	0.452	0.643	0.043	0.113
SR10x5					
Factor interaction	0.344	19.088	<0.001	0.656	1.000
Treatment	0.004	4701.310	<0.001	0.996	1.000
Group	/	0.086	0.918	0.009	0.061

Legend: FBT = Flamingo Balance Test; Tap = Plate Tapping; S-R = Sit and Reach; SBJ = Standing Long Jump; HG = Hand Grip; S-U = Sit Ups; BAH = Bent Arm Hang; SR10x5 = Shuttle Run 10 x 5m; **p** = Significance level; η2 = Partial Eta Squared (Effect Size)

Descriptive data on student attitudes towards FV before and after the experiment are shown in Table 6. The results of the mixed ANOVA (Table 7) reveal that the impact of the interventions was realized only in groups E1 and E2. The factor interaction was recorded for the three sub-scales (Comfort, Activity and Teacher) and revealed that the attitudes of the groups (E1, E2, K) differed significantly after the experiment. A significant interaction effect was absent only in the subscale Satisfaction, but even there the respondents attitudes of experimental groups improved significantly. Post Hoc analysis confirmed that the main source of variability was the Mean values increase only in two experimental groups. Greater progress was achieved in the E2 group, while there were no significant changes in the control group. In group E2, the attitude towards FV improved in all aspects (Satisfaction, Comfort, Activity and Teacher), while in group E1 there was no statistically significant change for Activity.

Table 6. Descriptive data for subjects' attitudes (entire sample) towards PE expressed before and after the experiment

			Pre-test		Post-test	
Sub-scale	*Group*	N	*Mean*	SD	*Mean*	SD
Satisfaction	Experimental 1	17	**3.56**	0.714	**3.80**	0.644
	Experimental 2	15	**3.62**	0.735	**3.84**	0.631
	Control	16	**3.61**	0.709	**3.73**	0.624
Comfort	Experimental 1	17	**3.81**	0.759	**4.02**	0.624
	Experimental 2	15	**3.86**	0.779	**4.04**	0.666
	Control	16	**3.87**	0.741	**3.89**	0.689
Activity	Experimental 1	17	**3.39**	0.855	**3.44**	0.817
	Experimental 2	15	**3.49**	0.864	**4.04**	0.553
	Control	16	**3.43**	0.862	**3.45**	0.831
Teacher	Experimental 1	17	**3.82**	0.339	**4.05**	0.196
	Experimental 2	15	**3.81**	0.359	**4.18**	0.210
	Control	16	**3.83**	0.333	**3.85**	0.351

Legend: *Mean* = Arithmetical mean; SD = Standard Deviation

Table 7. The Mixed ANOVA results related to the data of subjects' attitudes towards physical education from Table 6

Impact	Wilks' Lambda	F	**p**	η^2	Observed power
Satisfaction					
Factor interaction	0.953	1.111	0.338	0.047	0.233
Treatment	0.577	33.026	<0.001	0.423	1.000
Group	/	0.032	0.968	0.001	0.055
Comfort					
Factor interaction	0.751	7.478	0.002	0.249	0.928
Treatment	0.535	39.112	<0.001	0.465	1.000
Group	/	0.036	0.964	0.002	0.055
Activity					
Factor interaction	0.441	28.556	<0.001	0.559	1.000
Treatment	0.511	42.992	<0.001	0.489	1.000
Group	/	0.912	0.409	0.039	0.198
Teacher					
Factor interaction	0.749	7.551	0.001	0.251	0.930
Treatment	0.575	33.286	<0.001	0.425	1.000
Group	/	1.267	0.292	0.053	0.261

Legend: p = Significance level; η2 = Partial Eta Squared (Effect Size)

The obtained results reveal that the students of group E2 practiced more during the PE lessons than the students of the other two groups (E1 and K) because they spent the most time in vigorous moves (Figure 1). They were most active during the class where elements of the modern Cross-Fit program were used (as much as 68.33%), followed by the class with polygons (65%), and the class where Circular Workout was applied (60%). In all lessons of the first experimental and control group, the active time was less than 50%; in athletics class 49.17%, in gymnastics class 45%, in volleyball class 41.67% and in basketball class only 40.56%. The students of group E2 spent twice as much standing time in class as their classmates from the first experimental and control groups (Figure 1). It is a clear proof that the students in the extended PE lessons that were realized in the opposite shift used their practice time much more effectively. In groups E1 and K, obviously more time was spent on the teacher's explanations and waiting for their turn to perform the motor task.

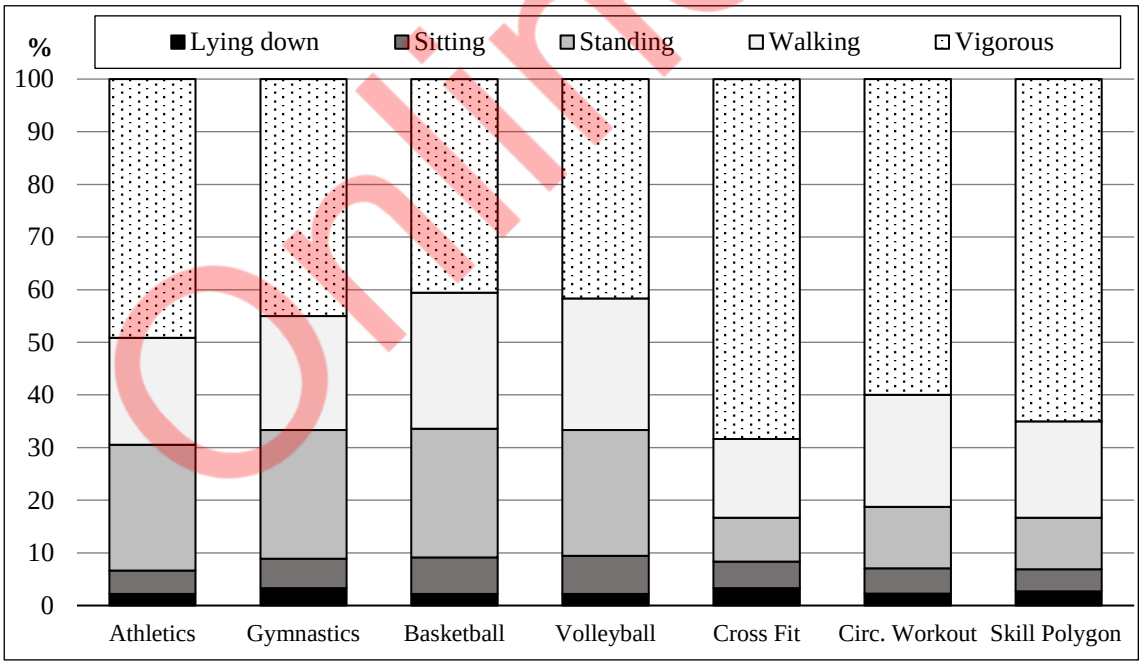

Figure 1. Activities share of different intensity in PE classes with specific contents

DISCUSSION

This experimental study was concerned with the outcomes of physical education (PE) teaching in secondary schools. A study was conducted with three classes of the fourth grade of the gymnasium in Kosovska Mitrovica, in which the effects of two experimental programs of organizing PE classes were

monitored. These models deviate from the standards prescribed by the official curriculum of secondary schools in R. Serbia. The experimental programs were limited by the time frame and daily duties of the students, which was determined by the regular class schedule. The curriculum of secondary schools in Serbia prescribes the implementation of two lessons of PE per week for a duration of 45 minutes and at the same time foresees that within that modest time, very ambitious teaching outcomes will be achieved (SAPESP, 2023). Some studies point to the unfavorable situation of school PE in Serbia. Most of the planned outcomes are not realized in practice (Acković, 1991; Kukolj, 2003; Maksić, 2000), as one of the main reasons for this, the authors cite the small number of classes, but also the insufficiently efficient use of time during them (Kostić, 2020; Marković, 2012). It has been shown that PE teaching in secondary schools in Serbia is primarily reduced to the acquisition of sports skills (Rodić, 2002), which students do not benefit from throughout their lives, while Polić (1965) noticed an almost insignificant effect on motor and functional abilities long ago.

Although the curriculum includes theoretical classes in physical education, they are used very little. When this fact is added to the harmful influence of the spread of wrong information about exercise and nutrition through various quasi-professional blogs and social networks, it becomes even clearer why there are more and more obese young people in Serbia (as in the whole world) and why non-communicable diseases are rapidly spreading, which are considered a direct consequence of hypokinesia (Mitić, 2011; Romanov et al., 2014; Sorić, 2012). Children and youth are not only insufficiently physically active, but also lack adequate education about exercise and health. All public health organizations point to the importance of regular PA for the proper development of children and youth (CDC, 2019; EUPEA, 2021; WHO, 2018), and all relevant Ministries (of education, health, youth and sports), as well as school authorities, are declaratively committed to this. In spite of this, nothing has been fundamentally changed in Serbia during the last decades in order to improve school PE. The severity of this problem is indicated by the data that for most children (about 85% of students), PE at school is the only form of physical activity (Hardman et al., 2007).

The importance of regular FA, and especially school FV, is always highlighted in public discourse, but little concrete action is taken. This study represents a modest attempt to make a contribution to the creation of better conditions for the realization of the results of school PE in the existing legal framework and with society's lack of interest in fundamentally solving the problem. The idea has been checked that only with the help of minor methodical variations, which are realistically achievable in the given circumstances, to examine whether and to what extent a different organization of the existing class fund, and the introduction of some different contents, can contribute to the PE improvement. The main operators used were theoretical teaching and extended PE classes organized in the opposite shift. In one experimental class (group E1), the potential of theoretical teaching was used with the idea of providing students with information that will motivate them to be more physically active outside of school on their own, or with their families. The aim was for the students of this class to acquire expanded knowledge about the principles of healthy exercise and healthy nutrition, and to apply those motor tasks in their free time that can contribute to the prevention and preservation of physical health. The students of this class had theory lessons in a traditional classroom instead of one PE lesson in the hall (or on the outdoor sports ground). The findings of previous studies that claim that two classes are certainly insufficient to cause training stimuli with the required strength and volume for a more serious impact on motor and functional abilities, reduced doubts that this less scope of activities will cause damage for the students, when they already have few opportunities to exercise at school. Experts from influential world organizations such as ACSM (2018) and WHO (2014) believe that only everyday PA of moderate intensity provides the health minimum necessary for children and youth.

The students who had regular theoretical classes (group E1) were not expected to improve their motor skills under the influence of the experimental treatment, but it was to improve their attitudes towards exercise and PE teaching. For group E1, it was much more important that during the experimental period there was no decline in motor abilities due to one less exercise lesson in the schedule. This was one of the

starting hypotheses of this study and it was completely proven, considering that in this group with a reduced number of active PE classes, there was no motor abilities decline. On the contrary, a slight increase in average values was recorded for all motor variables during the experimental period. None of these changes was statistically significant and could not be attributed to the influence of the experimental factor, but it is unequivocal evidence that the reduction in the number of hours of active PE classes did not negatively affect the students' motor abilities. All these numerical changes are explained by the action of some uncontrollable factors, probably greater motivation at the end of the experiment or the experience the subjects gained during the initial measurement.

The greatest improvement in motor skills was achieved in the second experimental group, where statistically significant changes were registered for all variables (strength of all current muscle groups, speed of repetitive movements, endurance, flexibility, balance). This finding was expected considering that group E2 exercised the most. In order to increase the scope of activities, classes are organized in the opposite shift, and the emphasis was placed on the intensity of exercise by choosing specific contents. In order to achieve a greater volume and intensity of activities, sports education has been sacrificed. Modern fitness programs dominated the classes of the E2 group, while the teaching of sports technique related to elements of athletics, gymnastics and ball games was absent. The progress of motor skills in group E2 proves that positive effects can still be achieved in school conditions with two adapted physical education lessons per week. This adaptation implies, first of all, the extension of the class and the selection of more efficient motor content.

One of the initial hypotheses predicted positive changes in attitudes towards PE of group E1 respondents. This hypothesis was fully confirmed, i.e., a statistical comparison of the results obtained before and after the experimental treatment proved that the subjects of group E1 on the final assessment (post-test) had higher average values of all four subscales (satisfaction, comfort, activity and teacher) than of the average obtained on the initial assessment (pre-test). These results fit the observations of previous studies (Digelidis et al., 2003; Kelso et al., 2020; Pacala et al., 2017; Quinn et al., 2008) in which it was stated that theoretical knowledge (education) about exercise and health significantly influence the formation of positive attitudes towards PA and increase the motivation to participate in it.

The second experimental treatment is based on the idea that students will practice more relaxed and with greater motivation in classes in the opposite shift. It was expected that this would be influenced by the students' feeling that after the PE class they do not have to rush to the next class, that they do not have time to change their clothes calmly, or that they feel uncomfortable because they have to go to the next class in a sweat. The increased class time (from 45 to 60 minutes) should have contributed to greater comfort, which allowed the teacher to realize all the planned contents without haste. The results of the statistical analysis, which compared the students' attitudes towards PE before and after the experiment, revealed a significant increase in all average grades with which the respondents evaluated some aspects of PE (satisfaction, comfort, activity, teacher). Statistical findings showed that the attitudes of the three groups (E1, E2, K) before the experiment did not differ significantly in any sub-scale, while at the end of the experiment the scalar averages of both experimental groups were significantly higher than the control group. This proves the positive impact of experimental treatments on the attitudes of high school students towards PE.

In addition to making students more comfortable before, during and after the PE class, the E2 group program was expected to increase the volume and intensity of exercise in the class, which is why elements of some group fitness programs that emphasize the development of motor abilities were used. With this choice, the students were deprived of the opportunity to learn more about some elements of athletics and gymnastics, as well as the technical-tactical elements of basketball and volleyball in PE classes. Many PE and sport pedagogues will probably object to this experimental program because of the sports-technical education lack. However, it is important to critically look at the utility value of those sports contents, that is, to ask question: how do students benefit later in life from learning how to perform shot put properly, or how to do a long jump technique properly, or how to play pick and roll in basketball, or how to protect a block after a volleyball smash? It is justified to express the dilemma whether and to what extent it is possible to master

any specific element of sports technique in such a short time offered by the PE class and what is the purpose of such superficial information? Without the intention to diminish the value of sports and technical knowledge, this study started from the assumption that it is much more important for children of the new technological age to satisfy the need for daily and weekly workout in PE classes, as well as to build positive emotions towards exercise.

A contribution to this thinking about the expediency of sports and technical knowledge, as well as the benefits brought by increasing motor skills for everyday life, are data of the active workout time at the PE class measured during the application of various teaching contents. The results obtained show that the students that had extended classes in the opposite shift (group E2) spent significantly more time in vigorous activities (more intense than walking) than their peers from the other two groups (E1 and K) whose activity was measured on the sessions whit teaching units of the usual curriculum (from athletics, gymnastics, basketball and volleyball). In the classes of group E2, group fitness programs were applied, where the emphasis was placed on the general motor abilities development, while neglecting sports and technical knowledge. In classes with standard teaching units (athletics, gymnastics, basketball and volleyball), not even 50% of active workout time was reached (in athletics 49%, gymnastics 45%, volleyball 42% and basketball 41%), which is less than the recommended minimum (AfPE, 2015; CDC, 2019). On the other hand, in the classes of group E2, which were organized as fitness training for the average health of recreational athletes, the exercise time was more over than 60% in all classes. The most active time was achieved in a class that used elements of the Cross-Fit program (68%), followed by a class with the polygons (65%), and a class organized as the Circular Workout (60%). These differences are even greater when expressed in minutes. Thus, students in the athletics class had an average of 22 minutes of activities more intense than ordinary walking, in the gymnastics class 20 minutes, in the basketball class 18 minutes and in the volleyball class 19 minutes. At the same time, students who participated in adapted fitness activities in the PE class spent much more time in vigorous exercise - as much as 41 minutes at the Cross-Fit class, 39 minutes at the class with polygons and 36 minutes at the Circular Workout. The observed differences are very large, even considering that the lessons of the second experimental group lasted 15 minutes longer than the standard FE lessons. This information is another proof of the justification of extending the class to 60 minutes, as well as organizing it in the opposite shift.

By comparing the results of the motor variables that the subjects of group E2 had before and after the experimental treatment, it was unequivocally proven that they achieved a significant improvement in all motor abilities assessed by the EUROFIT battery. Although they did not get the opportunity to perfect the technique of the long jump, to try how to perform the swing on the still rings, they did not practice receiving the serve with the fingers and the hammer, etc. - the students of the group E2 improved significantly their motor status, practiced more in class, and in addition built more positive attitudes towards PE and experienced more satisfaction and comfort in classes at their school.

For this study, it is important to refer back to the results of the control group that was introduced in order to eliminate as much as possible the impact of the uncontrolled environmental factors and received more reliable conclusions. A two-way ANOVA confirmed that the groups did not differ statistically significantly before the experiment in any of the eight motor variables, as well as four variables related to attitudes towards PE. Considering that the students of the class selected for the control group were not exposed to any special treatment, and that before the experiment they did not differ significantly compare to their peers who formed the two experimental groups, good prerequisites were created that all the differences between the groups in the final measurement can explain by the experimental factors action.

Initial measurements revealed that the subject's gender significantly influenced the differences in some motor variables. The effect of gender on the respondents' attitudes was not proven, which means that boys and girls express the same attitude towards all aspects of PE teaching. Given that the research was conducted with adolescents (18-year-olds) when the differences between boys and girls were already clearly expressed, it was realistic to expect that boys are stronger and faster than their peers. The results obtained are

completely consistent with current theoretical positions and findings of previous studies (Čarapić et al., 2019; Haywood & Getchell, 2014; Milošević, 2019). Based on the results obtained during the initial testing, it was decided to analyse the changes in motor skills that occurred during the experimental period separately for boys and girls, while the impact of the treatment on the attitudes of the subjects was analysed on the complete sample.

Statistical analysis revealed that all positive changes were most pronounced in the group that had PE in the opposite shift and practiced in extended classes. Statistical analysis revealed that all positive changes were most pronounced in the group that had PE in the opposite shift and practiced on extended sessions. It is interesting that this group (E2) made more progress in terms of attitudes than the group that had regular theoretical classes (E1). The formation of statistically significantly more positive attitudes under the influence of the experimental treatment was also recorded in group E1, but this progress was less pronounced than in group E2. This shows that any greater engagement of teacher in the students' education process brings positive effects. It turned out that practical teaching (exercise) has a greater influence on student attitudes than theoretical ones and that, when it comes to physical education, priority should always be given to practical work in the gym or on the outdoor sports ground. As the most effective solution to the current problems of high school PE in Serbia, a teaching model could be recommended for pedagogical practice, which includes two extended lessons in the opposite shift, plus one mandatory lesson of theoretical teaching in the classroom (model 2+1). With this model, the total weekly workload of students is not disturbed, and space is opened for the employment of an additional number of physical education teachers, of whom, according to the official records of the Republic's Employment Service, there are currently around 2,000 in Serbia. This solution requires additional funds and represents an additional burden on the budget. However, bearing in mind the health benefits of regular PA, rough calculations show that investing in school PE would indirectly bring large savings in the health care sector. The experiences of many EU countries (Hardman, 2007) show that investing in health prevention is much more effective than treating non-communicable diseases, which are largely caused by hypokinesia and poor lifestyle of children and youth.

CONCLUSION

Based on the obtained results, it is possible to conclude that the reduction in the number of physical education lessons in which active exercises are carried out, from two to one, has no negative consequences for the motor status of high school students. One or two hours of physical education a week, so - it doesn't matter. At the same time, it has been shown that extending physical education classes to 60 minutes and performing them in the opposite shift can produce sufficiently strong training stimuli to improve motor skills tested by the EUROFIT battery (balance, speed, arm strength, explosive leg strength, hand grip strength and flexibility). In both experimental groups, more positive attitudes were formed towards various aspects of physical education (satisfaction, comfort, activity in classes and teacher's attitude towards students and teaching). As no significant change in any variable was recorded in the control group for the same period of time, all positive changes can, to a large extent, be attributed to the experimental treatments.

In addition to the positive impact on the motor skills of high school students and their attitudes towards physical education, the program of the second experimental group (two extended classes in the opposite shift) proved to be more effective for the use of time. In all the standard 45-minute classes, which the respondents of the first experimental and control groups had, the exercise time was less than the recommended 50%. In all the sessions of the second experimental group, in which the contents of group fitness programs were applied, the active workout time was greater than 60% (even 68% in a class with Cross-Fit elements). Considering the weak material conditions in Serbian schools and the lack of numerous equipment, the use of which (despite everything) is provided for in the school curriculum, it would be justified to think about and organize professional debates and, as a priority outcome of physical education, to

determine - meeting the minimum movement needs of students. This idea is supported by the fact that most children today spend most of their time at school, and as many as 85% of them do all their physical activities at school. Another important outcome could be familiarizing students with those contents and equipment that are realistically applicable throughout life and can be used on a daily basis. An example of this is a hop-rope and an elastic band, the use value of which was checked in current study. Therefore, in addition to fulfilling the basic health needs for physical activity, students should be educated about the importance of regular exercise and to know choose appropriate motor content and equipment that they can use at all ages and in all circumstances.

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