

Research article

**EFFECTS OF THE FITT PROGRAM ON PHYSICAL ACTIVITY
AND HEALTH-RELATED FITNESS IN PRIMARY SCHOOL AGE
CHILDREN**

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Abstract. *Evaluation of the effects of an eight-week innovative FITT program of Physical Education to Physical Activity (PA) and health-related fitness (HRF). In the experimental group (N=92), with FITT guidelines, the students have been "introduced" to the development of the HRF zone. There have been 16 classes for the development of the aerobic fitness and 8 classes for the development of muscular fitness. Flexibility has been developed in the final parts of each class. The control group (N=86) attended traditional classes of the same volume. Before and after the intervention, the HRF components evaluation was performed with the battery of FITNESSGRAM tests and the PA by the pedometer OMRON HJ-320. Both groups showed a significant increase in the maximum consumption of oxygen and the number of depleted shares (PACER laps), with the simultaneous decrease in the PA level. The FITT program significantly contributed to the improvement of aerobic fitness, muscular fitness and partially flexibility. There was no difference between the group in the body composition and the PA level. FITT intervention is a promising school strategy for improving the aerobic and muscular fitness of students.*

Key words: *school intervention, physical education, third-grade students*

INTRODUCTION

There is an increasing number of scientific evidence of the positive effects of PA (Strong et al., 2005; Physical Activity Guidelines Advisory Committee, 2008; Kamijo et al., 2011; Centers for Disease Control and Prevention, 2010; Fedewa & Ahn, 2012) and the interconnected HRF (Smith et al., 2014; Faigenbaum et al., 2009; Ruiz et al., 2009; LaVigne, Hoza, Smith, Shoulberg, & Bukowski, 2016; Coe, Pivarnik, Womack, Reeves,

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& Malina, 2012; Sardinha et al., 2016; Scudder et al., 2014) on the physical and mental health of children and youths.

Contrary to the many benefits, the physical activity of children of all ages is constantly decreasing (Bornstein, Beets, Byun, & McIver, 2011; Konstabel et al., 2014), and consequently the HRF (Ostojić & Stojanović, 2010; Ostojić, O'Neil, Calleja, Terrados, & Stojanović, 2010; Ostojić, Stojanović, Stojanović, & Marić, 2010; Ostojić, Stojanović, Stojanović, Marić, & Njaradi, 2011; Đordjić et al., 2016).

Considering the current situation, it is necessary to increase the volume (frequency, intensity or duration) of physical activities in all age groups (Cvejić & Buišić, 2012) and especially those types of activities that will contribute to the development of HRF components (aerobic fitness, muscular fitness, flexibility and body composition).

There are numerous programs in the world for increasing PA and improvement of the HRF of children and adolescents: school-based, family-based, Programs of the local or wider community, on-line programs, comprehensive programs. [TAKE 10 (Goh, Hannon, Webster, Podlog, & Newton, 2016); Sports, Play and Active Recreation for Kids – SPARK (McKenzie, Sallis, & Rosengard, 2009); Healthy Hearts 4 Kids (Palmer, Graham, & Eloise, 2005); Middle School Physical Activity and Nutrition M-SPAN (McKenzie et al., 2004); Health Optimizing Physical Education – HOPE (Sallis et al., 2012); Born to Move – BTM (Fairclough et al., 2016); Knowledge in Action - KIA (Hodges, Kulinna, Van Der Mars, & Lee, 2016); Comprehensive school PA program – CSPAP (NASPE, 2008); Kinder-Sportstudie - KISS (Zahner et al., 2006); and many others].

According to the recommendations of numerous studies and leading organizations (Burgeson, Wechsler, Brener, Young, & Spain, 2001; Council of Europe, Committee of Ministers, 2004; Pate et al., 2006; WHO, 2004), schools should take on the role of leaders in increasing PA and improving students' HRF. School interventions contribute to an increase in the duration of physical activity of 5 to 45 minutes per day, reduce the time spent watching television from 5 to 60 minutes per day and increase the maximum oxygen consumption from 1.6 to 3.7 ml/kg/min (Dobbins, Husson, DeCorby, & LaRocca, 2013). While some school programs include additional physical education (PE) classes or additional activities (active breaks, activities before or after classes), others are based on curriculum changes. Increasing frequency and duration is not always possible, given the competitive requirements of the curriculum, so it is important to stimulate physical activity within classes and breaks, and to develop strategies for more efficient use of PE classes.

The aim of the research is to evaluate the effects of the foremost innovative FITT Physical Education Program on PA and HRF of primary school age children.

METHODS

The research is a quasi-experimental, of a longitudinal type and was conducted from September to December 2015. It was used a pretest - posttest research project with randomized groups. Of five elementary schools in Sombor, by random selection, four classes from three schools were assigned to the experimental (EXP) group, and four into the control (CON) group. In the EXP group, through the FITT Guidelines, students have been "introduced" to the development zone of health-related components. After eight

weeks, 16 classes were done for the development of aerobic fitness and 8 classes for the development of muscular fitness (three 45 minute/classes/week). Flexibility has been developed in the final part of each class. The experimental program, based on the preparation conceived by the author, was realized by two previously instructed students of the Faculty of Education. In the CON group, teachers, based on personal preparations, realized a regularly planned curriculum, with traditional teaching strategies.

Participants

The research approval was obtained from the University of Novi Sad and the Faculty of Sport and Physical Education in Novi Sad, Republic of Serbia. Before conducting the research, written consent was received from the director of all three schools and the parents of children included in the research.

The sample has the characteristics of an appropriate and random group (cluster) sample. Out of the 182 third-graders included in the survey, 178 students (aged 9.02 ± 0.33 years old at the initial testing) participated in the interpretation of the results, of which 92 in EXP and 86 in CON group (two excluded due to developmental disturbances, one changed schools and one got sick).

Measuring instruments and organization of measurements

Health-related fitness was assessed using the FITNESGRAM battery test (The Cooper Institute, 2010). The aerobic fitness was assessed using the Progressive Aerobic Cardiovascular Endurance Run test (PACER laps). Based on this test, using the regression equation (Mahar, Guerieri, Hanna, & Kemble, 2011) the maximum oxygen consumption (VO_{2max}) was calculated. Muscular form was assessed by the tests: curl-up and 90° push-up. Flexibility was assessed by the tests: back-saver sit and reach - left leg stretched (LLS) and back-saver sit and reach - right leg stretched (RLS) and shoulder stretch left hand up (LHU) and shoulder stretch - right hand up (RHU). Body composition was assessed by measuring skin folds on triceps and calf by the Slim Guide Skin fold caliper, as well as calculating the body mass index (BMI). To calculate the body fat percentage (BFP) based on the measuring skin folds on triceps and calf it was used the formula developed by Slaughter and Lohman (Slaughter et al., 1988).

Two weeks before the start of the research study, there was a lecture on the correctness of the performance of the tests for the evaluation of HRF components, which is consistent with the FITNESSGRAM Guidelines. Before and after the experimental program, prepared examiners "blinded" by the group's affiliation, performed the testing. The examiners had an identical task on both measurements.

PA was evaluated by a pedometer OMRON HJ-320 which has a seven-day memory with automatic recording at 00:00 h. In previous studies (Park, Lee, Ku, & Tanaka, 2014), it showed a solid accuracy of measurement at different movement speeds (from 54 m/min to 161 m/min) and at different places of wear (in the pocket, on the chest, on the belt, on the hand or in the purse). One week before the start of the experimental program, the students carried a pedometer based on which initial data were obtained on the number of steps taken. The final measurement was done in the last week of the program.

All pedometer results below 1 000 daily steps and above 30 000 daily steps were erased and treated as missing data (Rowe, Mahar, Raedeke, & Lore, 2004). The

replacement procedure for missing data was carried out according to the procedure of Kang, Zhu, Tudor-Locke, & Ainsworth (2003). After the data was sorted, 18 data on the initial measurement and 14 on the final one were missing. These data were further replaced with the average value of the group on the day the data was missing. The final result of the number of steps taken has been calculated for each respondent as the average number of steps during the day (average daily steps).

FITT program

The FITT program is a comprehensive program for the more efficient use of existing PE classes found in the lower grades of elementary school. It was created by the synthesis of scientific information from effective school interventions. It focuses on improving the components of the health-related fitness, which is possible only if it is exercised in their development zone. It rests on a scientific concept which has not found application in the traditional teaching of physical education. This concept includes the basic principles of training (overload, progression, specificity, continuity and individuality), the application of which is facilitated by FITT guidelines (FITT is an acronym frequency, intensity, time, type) (Ayers & Sariscsany, 2011). In the FITT program, primarily teaching contents, methods, forms and other teaching instrument of work are used so that the planned physical activity or exercise by frequency, intensity, duration and type leads to the improvement of aerobic fitness, muscular fitness and flexibility, and indirectly to the improvement of body composition (see Table 1).

Table 1

HRF	Frequency	Intensity	Duration	Type
Aerobic fitness	2 classes/week	a) moderate	Continuous activity up to 5 minutes	Activities that engage large muscle groups (running, fast walking, skipping rope ...)
		b) high with periods of rest	Intensive activity for 3-4 minutes with shorter rest periods	Activities that engage large muscle groups (polygons or elementary games)
Muscular fitness (strength, endurance, power)	1 class/week	Very light loads	1 to 2 series; 8-10 exercises; from 6 to 15 reps (36 to 90 seconds); Total duration is 20 - 28 minutes	Exercises to strengthen larger muscle groups; One exercise per muscle or muscle group
Flexibility	3 classes/ week (final part of the class)	Light (static) stretching of the muscles until the first appearance of pain and discomfort	2 stretches for the same muscle group; keep the segment stretched for 10-20 seconds; pause for 10 seconds; 5 exercises per class;	All muscle groups (depending on class activity)

The basic principles of training and FITT guidelines are well described in the Physical Education for Lifelong Fitness: The Physical Best Teacher's Guide (Ayers & Sariscsany, 2011) and Fitness for Life (Corbin & Le Masurier, 2014). The basic principles of training are the foundation for all physical exercise programs, and the same should also be applied for PE classes.

At the same time, when creating the FITT program, it was taken into account that it should contribute to the students’:

- development of knowledge (cognitive domains) about health-related fitness components and ways of its improvement, proper nutrition, importance of fitness for health, risks of inactivity, recommendations regarding physical activities and sedentary time;
- acquisition of knowledge and skills (a psychomotor domain) through which students will be able to develop components of the HRF;
- developing positive attitudes (affective domains) about physical activity and physical exercise.

In order to plan time in the primary school age children in accordance with the basic principles of training and FITT guidelines, 5 methodological approaches from 11 described in Mosston & Ashworth (2008) were used: direct, practical teaching, work in pairs / group, inclusion and learning through discovery. The above-mentioned methodical approaches require more time to prepare the class, but they enable individualization, everybody’s involvement in the exercise process, regardless of their previous abilities, intensification of activity in class and increased active exercise time.

Statistical Analysis

The data obtained by testing were entered into the statistical package of SPSS® 20.0 (Statistical Package of Social Sciences - for Windows, Inc., Chicago, IL). As part of the preliminary analysis, the basic descriptive statistics were calculated (mean, standard deviation) and normal distribution were tested using the Kolmogorov-Smirnov test. Data whose distribution deviated from the normal have been transformed (only on initial measurement for variables: BFP, Curl-up, LLS and RLS). Variable 90°push-up had a distribution on both measurements that deviated from normal and could not be transformed. With the variable BFP, the extreme value at ID55 was replaced before the analysis with the first lower value of the complete sample (40.68 at the initial measurement and 39.56 at the final measurement). The quantitative differences at the initial measuring between the EXP and CON group were determined for the categorical data by the Chi-square test for independence testing, for regularly distributed and transformed data by independent samples t-test, and for data whose distribution deviated from normal with Mann-Whitney U Test.

The effect of intervention on the aerobic fitness (PACER laps and VO_{2max}) and the level of physical activity (average daily step) was established by the 2 x 2 ANOVA (group x time). In the remaining variables, the quantitative differences during the final measurement are established as during the initial one (depending on the type and distribution of data).

RESULTS

Initial comparisons

By examining the differences between the EXP and CON group at the initial measurement (see Table 2), it was found that none of the 9 observed variables had statistically significant differences at the assessment level $p < .05$.

Chi-squared test with Yates continuity correction did not show a statistically significant difference between groups not even in the variable LHU, $c2(1, n = 178) = .03$, $p = .86$, $\phi = .03$, neither in the variable RHU, $c2(1, n = 178) = .41$, $p = .52$, $\phi = -.07$. U EXP group 30 (32.6%) participants', and in CON group 26 (30,2%) the participants' failed to fulfill the task that represents the variable LHU. The task which represents the variable RHU failed to fulfill 8 (8.7%) participants' in the EXP group and 11 (12,8%) in the CON group.

Table 2 Basic descriptive statistics and group differences on initial and final measurement

Outcomes	EXP group (N = 92)		CON group (N = 86)		Pre	Post	p	P
	Pre	Post	Pre	Post				
Age (years)	9.02± .33		9.01± .27					
Body mass (kg)	33±7.5	33.73±7.68	34.5±8.2	35.36±8.55				
Body height (cm)	137.1±6.71	137.89±6.84	138.26±5.56	139.08±5.76				
Body mass index (kg/m2)	17.45±3.15	17.61±3.1	17.90±3.27	18.14±3.45	.34	.29		
Body fat percentage	18.52±6.92	18.48±6.95	19.83±7.47	19.79±7.55	.20	.23		
^a Curl-up (repetition)	9.45±8.15	18.49±10.74	10.97±7.49	12.36±8.65	.12	.000		
90 ⁰ push-up (repetition)	5.60±5.69	8.38±7.34	4.58±5.85	4.43±5.66	.09	.000		
Back-saver sit and reach - left leg stretched (cm)	24.74±4.82	25.07±4.7	25.87±5.01	24.58±5.22	.09	.52		
Back-saver sit and reach - right leg stretched (cm)	24.60±4.89	24.66±4.69	25.55±5.21	24.44±5.19	.11	.77		
PACER (laps)	17.53±9.12	21.96±10.26	15.69±7.01	17.16±8.06	.13			
VO ₂ max (ml/kg/min)	39.96±4.86	41.45±5.09	39.22±4.65	39.61±4.87	.31			
Average daily steps	9900±3526	8836±2432	10488±3433	8425±2781	.26			

Note: ^a group comparison performed by Man-Whitney U test; Other comparison performed by independent sample t-test;

Final comparisons

A significant interaction occurred in VO₂max between the type of intervention and time, Wilks's lambda = .92, $F_{(1,176)} = 15.8$, $p = .00$, partially $\eta^2 = 0.8$. Significant separate influence of time was established, Wilks's lambda = .79, $F_{(1,176)} = 46.25$, $p = .00$, partially $\eta^2 = .20$, wherein in both groups there was an increase in the VO₂max. The individual impact of the two interventions was not significant, $F_{(1,176)} = 3.2$, $p = .076$, partially $\eta^2 = .02$, which means that both interventions contributed to the improvement of VO₂max.

A significant interaction between the type of intervention and time also occurred in the number of run distances (PACER laps), Wilks's lambda = .92, $F_{(1,176)} = 15.3$, $p = .00$; partially $\eta^2 = .08$. Significant separate influence of time was established, Wilks's lambda = .74, $F_{(1,176)} = 61.35$, $p = .00$, partially $\eta^2 = .26$, with both groups increasing in the number of run distances. It is important to note that the participants of the FITT program ran significantly more laps, $F_{(1,176)} = 7.01$; $p = .009$, partially $\eta^2 = 0.04$.

Statistically significant ($p < .001$) progress of the EXP group is also observed in the muscular fitness in both variables (Curl-up: $t(178) = 4.18$, $p = .000$, mean difference = 6.13, 95%CI: from 3.23 to 9.02, $\eta^2 = .09$; and 90⁰ push-up: EXP group Md = 7 vs. KON group Md = 2, $U = 2439.5$, $z = -4.44$, $p = .000$, $r = .33$) (see Table 2).

There were no statistically significant differences between groups in body composition (BMI, BFP) and flexibility (LLS, RLS).

At the final measurements in the EXP group of 11 participants or 12%, and in CON group 24 participants or 27.9% failed to fulfill the task representing the variable LHU. A much smaller number of participants, 3 or 3.3% in the EXP and 10 or 11.6% in the CON group failed to fulfill the task that represents variable RHU. Chi-square independence test (with Yates correction of continuity) showed statistically significant difference in favor of EXP group in variables LHU, $\chi^2(1, n = 178) = 6.18, p = .01, \text{fi} = -0.20$, while in the variable RHU, was on the very threshold of significance $\chi^2(1, n = 178) = 3.44, p = .06, \text{fi} = -0.16$.

At the PA level, significant interaction occurred between the type of intervention and time, Wilks's lambda = 0.97, $F_{(1,176)} = 4.91, p = .03$, partially $\eta^2 = .03$. PA level, expressed by the average number of daily steps between two measurements in both groups decreased, Wilks's lambda = .78, $F_{(1,176)} = 48.16, p = .00, \eta^2 = .22$. The individual impact of the two interventions was not significant, $F_{(1,176)} = .05, p = .82$, partially $\eta^2 = .00$, which means that neither of the programs was effective enough.

Due to the previously established statistically significant differences between boys and girls aged 9, in flexibility, body composition, aerobic capacity and PA, the calculation of average values on initial and final measurement by gender for the whole sample was performed, as well as the determination of the significance of the difference between the t-test series.

By looking at the data presented in Table 3, we can conclude that there are statistically significant differences in boys' and girls' differences in flexibility, aerobic ability, level of physical activity and body composition (BFP). The body mass index "concealed" the real differences in the body composition that at this age exist between boys and girls.

Table 3 Differences by gender on initial and final measurement

Outcomes		Whole sample		<i>p</i>	<i>t</i>	η^2
		Female N=86	Male N=92			
Body mass index (kg/m ²)	Pre	17.87±3.68	17.47±2.73	.41	0.41	0,00
	Post	17.98±3.71	17.76±2.82	.66	0.66	0,00
Body fat percentage	Pre	20.82±7.11	17.59±6.98	.003	3.05	0,05
	Post	20.61±7.12	17.71±7.13	.007	2.72	0,04
Back-saver sit and reach - left leg stretched (cm)	Pre	26.47±4.67	24.18±4.93	.002	3.16	0,05
	Post	26.37±4.37	23.39±5.06	.000	4.19	0,09
Back-saver sit and reach - right leg stretched (cm)	Pre	26.38±4.76	23.82±5.02	.001	3.49	0,06
	Post	25.83±4.57	23.37±4.96	.001	3.42	0,06
V _O max (ml/kg/min)	Pre	36.91±3.75	42.11±4.21	.000	-8.68	0,30
	Post	37.75±3.87	43.19±4.61	.000	-8.49	0,29
PACER laps	Pre	14.06±5.65	19.05±9.46	.000	-4.33	0,10
	Post	16.34±5.97	22.73±11.13	.000	-4.82	0,12
Average daily steps	Pre	9298±2555	11012±4009	.001	-3.42	0,06
	Post	7920±2077	9308±2872	.000	-3.71	0,07

DISCUSSION

Aerobic fitness

Both traditional and innovative PE classes contribute to the development of aerobic fitness, as both groups have achieved significant statistical progress in $VO_2\text{max}$ and in the number of distances ran (PACER laps). Although it does not go hand in hand with this research, it must be acknowledged that one of the reasons for the increase lies in the fact that during the long summer break children are insufficiently active, which causes a fall in HRF. With the start of school, PA is increased, and consequently also the aerobic fitness. Progress in the CON group is not surprising due to the fact that at the younger school age, during each PE class (three classes/week), competitor or play-like activities are being played (chase, dodgeball...) last for about 10 minutes, which contributes to the development of aerobic fitness.

However, a statistically significant increase in the number of distances ran (PACER laps) in the EXP group indicates that the FITT program is more effective than the traditional one.

Estimated $VO_2\text{max}$ of the students involved in this study, regardless of the time of measurement, is lower than in a similar study by Gallotta et al. (2017) and significantly lower than the standards defined for normally nourished European children of the same age shown in the work of De Miguel-Etayo et al. (2014). In relation to the normative values, on the overall sample, the $VO_2\text{max}$ student in our study at initial and final testing is below the 1st percentile for girls, while in the boys between 10th and 25th percentile. Our research also includes obese children, which can "bend" the actual picture when compared. Still, children from European countries appear to have a better aerobic form.

It is alarming that the average results of $VO_2\text{max}$ students in this survey are just slightly above the international threshold for identifying children with poor health by Ruiz et al. (2016) from 35 mL/kg/min for girls and 42 mL/kg/min for boys. On the initial measurement 21 (24.4%) girls and even 55 (59.8%) boys had values below this standard.

Statistically significant progress in the EXP group at the final measurement relative to the initial, with an average increase in the maximum oxygen consumption of 1.49 ml/kg/min, is in line with previous studies in this range from 1.6 to 3.7 ml/kg/min, was shown in the review of Dobbins et al. (2013). In this review, the greatest average improvement in the maximum oxygen consumption of 3.7 ml/kg/min was determined by objective measurements on the treadmill with spirometer in a study involving 182 students of an average age of 11 (Walther et al., 2009). The students in the Experimental group participated in everyday PE classes, in contrast to the Control group who had three classes a week. The intervention lasted for one year, and changes were observed in the body composition (BMI and BFP based on bioelectrical impedance), and changes in biochemical markers (total cholesterol, triglycerides ...). The effect of intervention was not registered on changes in BMI and changes in BFP.

In order to achieve and maintain aerobic fitness, a constant, convenient and specific dosage of the duration and intensity of aerobic activities is required (Lai et al., 2014) with emphasis on the total volume (Weineck, 2007). Although successful interventions to improve the aerobic fitness of children consisted of daily sessions of a duration of 45 minutes (Kriemler et al., 2011), the results of this study show that it is possible to make progress with two classes in the weekly cycle. In order to increase the total volume of activities in a two-class weekly cycle, it was necessary to increase the intensity of work

and the active time of exercise. Knowing and using the FITT guidelines, the application of the basic principles of training and "new" methodical approaches in our school practice, have allowed an optimal dosage for the development of an aerobic fitness at all classes.

Muscular fitness

The FITT program contributed to the development of muscular fitness. Progress of the EXP group is in line with the research (Faigenbaum et al., 2013; Faigenbaum et al., 2011; Jones et al., 2011) in which physical exercises are planned for muscular fitness development. Comparing the average values on the initial measurement in the variables Curl-up and 90⁰ push up, with results (Fox, 2014), hull lift AS = 29.67 and AS = 16.11, but also with other studies (Gallotta et al., 2016; Kabiri, Mitchell, Brewer, & Ortiz, 2017; Reynolds et al., 2010), we can conclude that the muscular fitness of our students is bad. Obviously, in our schools, the work done is insufficient to improve the muscular fitness. In order to make progress in the muscular fitness, it is necessary to specifically plan activities and exercises for their development, at least 2 to 3 times in a weekly cycle (Behringer, vom Heede, Yue, & Mester, 2010; Faigenbaum et al., 2009). Based on this research, it seems that even one class is sufficient to show the effect. As with aerobic fitness, to optimize the muscular fitness, optimal dosing is crucial, which has been achieved by the FITT program.

Flexibility

The flexibility of children of a younger school age is usually very high, with girls being more flexible. This was also shown by the results of the tests at initial and final measurements, where all average values for both Back-saver sit and reach for boys are over 23 cm, and for girls over 25 cm. Values are more than the minimum required by FITNESSGRAM health standards (for boys over 20.3 cm and girls over 22.9 cm). The results are based on age and gender according to the research presented in the United States (Fox, 2014) and the European Union (De Miguel-Etayo et al., 2014). Comparing the results of our research with standards (De Miguel-Etayo et al., 2014), we conclude that all the results (both for boys and girls) are high in the range from 75 to 90 percent.

The results of the final measurement showed statistically significant progress in the EXP group relative to the CON group only in the variable LHU.

The FITT program partly contributed to the development of flexibility, which was also found in other similar studies (e.g. Jarani et al., 2016). It is possible that initially a high degree of flexibility was established among students of this age, i.e. threshold reached, is the limiting factor in its development. Another possible reason is insufficient scope of activities. It is recommended that, apart from the stretching activities needed in the preparatory (warm up) and final (cooling down) part of the class, in the weekly cycle 3 times/week, some independent activities are organised that contribute to the development of flexibility. In this study, as well as the research of Jarani et al. (2016), such activities were not separately organized.

Body composition

Regardless of the progress in $VO_2\max$, there was no change in the BMI and BFP, which is similar to that of Walter et al. (2009). This result is consistent with the results of meta-analyses that concluded that interventions carried out in the school environment have little impact on BMI (Guerra, Nobre, Silveira, & Aguiar Carrazedo Taddeial, 2013; Harris, Kuramoto, Schulzer, & Retallack, 2009), but also on other measurements of the body composition of children (Harris et al., 2009). As a possible reason for failure of the interventions Harris et al. (2009) emphasize the insufficient level (duration, intensity, frequency) of physical activities necessary to make the change. Another possibility is that PA has a lesser effect on body composition than dietary factors. It is certainly a limiting factor that in some studies, included in the meta-analysis, maybe there has been a change in BFP (not a research outcome), but this does not apply to BMI. The BMI often conceals real differences in body composition, as observed in this study when comparing differences between boys and girls. Contrary to these results, interventions carried out in the school environment (Carrel et al., 2005; Kain, Uauy, Vio, Cerda, & Leyton, 2004; Kriemler et al., 2010) have a positive effect on the body composition. Basically these are comprehensive interventions from a minimum of six months. Some interventions include additional classes of PE (Kriemler et al., 2010). It is recommended that interventions that are implemented in the school environment and that are focused on changes in the body composition last for a minimum of one year (Guerra et al., 2013), and that they are comprehensive and involve all school staff, parents and the local community.

PA level

Between two measurements, PA dropped in both groups, which could have been expected, having in mind that the initial measurement was conducted from September 14 to 21, and finally from November 23 to 30, when there is very different daytime. Seasonal variations in PA measurement have already been explained (Beighle, Alderman, Morgan & Masurier, 2008; Gorely et al., 2011). Weather conditions created an additional problem. At the moment of initial measurement, Sombor was hit by a thermal wave with maximum temperatures of up to 36.5°C and without precipitation, and at the moment of final measurement, a cooler wave with rain (Republic Hydro-meteorological Service of Serbia, 2015). Bad weather conditions during the final measurement restricted children from playing outside.

Although not statistically significant, the decline in the level of activity in the CON group (the average difference between the two measurements is 2 063 steps) is more drastic than in the EXP group (the average difference is 1 064 steps).

According to the average number of steps accumulated by girls (9 298 steps) and boys (11 012 steps) at the initial measurement (when there were ideal conditions for physical activity and when all sports sections started after a summer break), we can conclude that they do not comply with the recommendations (Tudor-Locke et al., 2011) of the minimum required daily steps (girls 11 000 to 12 000 steps a day, and boys from 13 000 to 15 000). Although this data cannot be generalized to the entire population of children in Serbia, due to the sampling method, we can assume that the situation is similar.

Based on the results obtained from the pedometers, we could conclude that our intervention aimed at increasing the level of PA in children has little impact, as in the

meta-analysis of Metcalf, Henley, & Wilkin (2012). Comparability is not complete, given the fact that in the mentioned meta-analysis, as an inclusion criterion, an accelerometer was used which, unlike the pedometer, has the ability to quantify the duration, frequency and intensity of individual activities. However, by analyzing the results of the EXP group in the HRF components, we are seeing a new situation. Although the level of PA significantly decreased between two measurements, aerobic and muscular fitness significantly improved. It is impossible to make progress in shape without increasing at least one of the factors (frequency, time, duration or intensity of physical activity). The pedometer does not have the ability to quantify the duration, frequency and intensity of the activity, which is not the only disadvantage. The end result is also affected by seasonal variations, but also by meteorological conditions at the moment of recording. Based on the above facts, we can recommend that the effect of interventions on the increase of children PA should be better observed through changes in the aerobic fitness rather than on the PA measurement by pedometers. In any case, due to the comparability of the results, the complete circumstances in which the testing was performed (air temperature, precipitation, daytime, etc.) should also be shown.

CONCLUSION

On the basis of valid and reliable data collection techniques, we can conclude that PA is low among third-grade primary school students in Sombor and that it is not in accordance with valid recommendations. And HRF is at an unsatisfactory level. The great progress of the students who took part in the eight-week innovative FITT program is evident in the majority of observed variables, and exceptional progress has been achieved in aerobic and muscular fitness. The key element which led to improvement in the EXP group is probably the correct and optimal choice of the type, duration, intensity and frequency of physical exercise and physical activity in all of the PE classes. Individually tailored physical exercise is the most important factor that maintains and improves the Health-related fitness. By applying methodological approaches (Mosston & Ashworth, 2008), it is possible to develop an individually tailored program in teaching physical education for primary school age children. PE is the most important means of a society for the preservation and strengthening of children's health. In the following period, it is necessary to insist on increasing the number of PE classes to one class a day, but also on starting the school projects that contribute to the increase of students' PA and HRF (optional class of PE, extra class in extended stay, school sections for all children, organized physical activities on big breaks...). In the structure of PE, it is necessary to make big changes. Classes should be planned in accordance with scientific achievements in this field - basic principles of training and FITT guidelines and focused on the development of HRF components.

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EFEKTI FITT PROGRAMA NA FIZIČKU AKTIVNOST I FIZIČKU FORMU POVEZANU SA ZDRAVLJEM DECE MLAĐEG ŠKOLSKOG UZRASTA

Cilj istraživanja je evaluacija efekata osmonedeljnog FITT programa fizičkog vaspitanja na fizičku aktivnost (FA) i fizičku formu povezanu sa zdravljem (FFPZ). U eksperimentalnoj grupi (N=92) su putem FITT smernica učenici „uvođeni“ u zonu razvoja FFPZ. Realizovano je 16 časova za razvoj aerobne forme i 8 časova za razvoj mišićne forme. Fleksibilnost je razvijana u završnom delu svakog časa. Kontrolna grupa (N=86) je pohađala tradicionalne časove istog obima. Pre i nakon intervencije vršena je procena FFPZ baterijom testova FITNESSGRAM i FA pedometrom OMRON HJ-320. U obe grupe je došlo do značajnog povećanja u maksimalnoj potrošnji kiseonika i broju istrčanih deonica (PACER laps), uz istovremen pad nivoa FA. FITT program je značajno više doprineo unapređenju aerobne forme, mišićne forme i delimično fleksibilnosti. Nisu se ispoljile razlike između grupa u telesnom sastavu i nivou FA. FITT intervencija je obećavajuća školska strategija za poboljšanje aerobne i mišićne forme učenika.

Ključne reči: školska intervencija, osnovna škola, treći razred