

Original empirical article

EFFECTS OF A HIGH-LOW AEROBIC PROGRAM ON THE MORPHOLOGICAL FEATURES, FUNCTIONAL AND MOTOR ABILITIES OF FEMALE ELEMENTARY SCHOOL EIGHTH GRADERS

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Abstract. *The research was carried out on a sample of 31 female students, eighth graders from elementary school "Vožd Karađorđe" in Leskovac, who were divided into two groups: an experimental (N=16) and control (N=15) group. The principal aim of the research was to establish the effect of programmed instruction of high-low aerobics on the morphological features, functional and motor abilities of female elementary school 8 graders. The effects of a high-low aerobic program were monitored in the area of morphological features (eight variables), in the area of functional abilities (one variable) and in the area of motor abilities (12 variables). The experimental factor was represented by specially programmed high-low aerobic instruction, which lasted for eight weeks, and was realized during the course of regular PE classes. The control group attended the program prescribed by the National Curriculum of the Ministry of Education of the Republic of Serbia. The research results indicated that the high-low aerobic program led to an improvement in the morphological features, functional and motor abilities of the female students from the experimental group when compared to female students of the control group. The results obtained by the research indicated the positive aspects of high-low aerobics for the preservation of children's regular growth and development and its practical implementation in PE classes.*

Key words: *physical education, morphological features, functional and motor abilities, high-low aerobic.*

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INTRODUCTION

In the century in which technical development has surpassed the discoveries and inventions of all previous times, and the progress rate does not show signs of decline, the global pandemic of the “sedentary lifestyle” which has affected the entire mankind, with a tendency of spreading further, has made it necessary for us to find adequate solutions for a healthy lifestyle, care for physical and spiritual health, and proper nutrition, as well as the awareness of importance of human body movement (Žigić, 2003). Much research has indicated that children rank first in terms of vulnerability to physical inactivity, i.e. that the physical abilities of children do not correspond to their physical development, and that their functional and motor abilities are increasingly lower. The reasons for such a situation can be substantiated by the impact of modern society, mostly due to the “sedentary” lifestyle (Mitić, 2001), and on the other hand by the current position of physical education in our school system.

The school system enables various positive influences on education and upbringing, starting from nursery school up to university, and because of that schools should include activities that direct students to recognize real values, to develop motion competence and self esteem, the acquisition of necessary knowledge, values and attitudes in order to develop a healthy lifestyle. Could current PE instruction in our schools give a solution to the problems imposed by the modern habits of children?

The research indicated that elementary school PE classes cannot fully realize the assigned tasks and objectives, highlighting inefficiency, ineffectiveness and outdated organizational forms of work in the existing school system conditions (Saveljić, 1971; Reljić, 1979; Arunović et al., 1992; Maksimović, 2000). It was recorded that students in elementary school PE classes express only a part of their psychophysical potentials and achieve results below their possibilities (Saveljić, 1971; Reljić, 1979; Popov, 1995; Maksimović, 2000).

In the spirit of the current changes of the system of education, the question is whether an innovative program, such as high-low aerobic instruction, can positively affect students’ optimal growth and development, having at the same time practical applicability in PE instruction (Popov, 1995; Mandarić, 2003).

High-low aerobic, as one of the representatives of group fitness programs, has its origin in aerobic dance. The principal characteristics of this exercise program is the application of arm movements and different forms of leg movements connected into a dance steps, to be performed while standing but also in motion (in space), on different planes, at different durations (tempo, rhythm) determined by music, all aimed at developing the dancer’s aerobic abilities (Mandarić, 2003; Stojiljković et al., 2005; Mandarić, Kocić, Milinković, 2010). It can be of low impact when performing the steps with one foot always on the ground or of high impact, when as part of every step there is a phase when the legs are not in contact with the surface (Stojiljković et al., 2005, p. 80). Research into a group fitness programs indicated their positive influence on all the components of psychosomatic status, and on certain morphological features (Obradović, 1999; Mandarić, 2003; Sekulić et al., 2003; Grego et al., 2006; Cvetković, 2007), motor and functional abilities (Kuper, 1975; Kalajdžić and Karvak 1983; Vozarević, 1992; Nićin and Todorović, 1996; Sekulić, 1997; Ušanj, 1997; Obradović, 1999; Mandarić, 2003; Sekulić et al., 2003; Grasi et al., 2006; Cvetković, 2007)

The subject matter of the research was the effect of programmed high-low aerobic instruction on the morphological features, functional and motor abilities of female elementary school eighth graders.

The aim of the research was to establish the effects of programmed high-low aerobic instruction on the morphological features, functional and motor abilities of female elementary school eighth graders.

METHOD

An experimental method was applied in the research, with initial and final measurements and an experimental factor that lasted eight weeks as part of the regular PE classes, and which involved female eighth graders from the “Vožd Karadorđe” elementary school in Leskovac. In the aforesaid period, the experimental program was performed three times a week, for one school class period in the PE hall of the said school. The female students were divided into two groups: the experimental and control group. The experimental group (E) attended the programmed instruction of high-low aerobics. For the purpose of research realization, the choreography of high-low aerobics was designed (for every class), and consisted of high and low intensity steps. Every class was divided into an introductory-preparatory, main and final part. The introductory-preparatory part of the class consisted of exercises intended for the preparation of those muscular groups which were supposed to be most used in the main part (exercise with small amplitude of movements, light stretching exercises, moderate pace of work and simple coordination). In the main part of the class, aerobic choreographies and strength exercises were realized, and the final part of class consisted of stretching exercises for those muscle groups that were most engaged in the main part of the class. The control group (K) attended regular PE classes (athletic instruction content), prescribed by the National Curriculum for PE classes of the Ministry of Education of the Republic of Serbia.

Sample of participants

The research was used on a sample of female eighth graders (N=31) from the “Vožd Karadorđe” elementary school in Leskovac, with an average age of 14, divided into two groups:

- E – experimental group (N=16), and the
- K – control group (N=15).

Sample of variables

The choice of measuring instruments was made based on the research data of both national and foreign authors, as well as on standardized measuring instruments applied in this kind of studies. The measuring technique of the Eurofit testing battery for school age children was used.

The variables of **morphological features** were the following:

- Body height (BH);
- Body mass (BM);
- Body mass index (BMI);

- Triceps brachii skinfold (TBS);
- Biceps brachii skinfold (BBS);
- Subscapular skinfold (SCS);
- Supraspinal skinfold (SUS);
- Medial calf skinfold (MCS).

The **functional ability** variable was:

- the shuttle run (SHUTTLE RUN).

The variables of **motor abilities** were the following:

- the “Flamingo“ test for the assessment of static balance (FLAM);
- the Hand Tapping test for the speed of arm movement (HTAP);
- the Sit-and-Reach test for the assessment of trunk flexibility (SAR);
- the Standing Broad Jump test for the assessment of explosive leg power (SBJ);
- Sit-ups, a test for the dynamic power of abdominal and thigh muscles (SU);
- the Dominant Handgrip, which measures forearm muscles (DHG);
- the Bent Arm Hang, which assesses static arm/shoulder girdle strength (BAH);
- the Cone drill 10x5m test for the assessment of running speed with a change of direction (CD – 10x5m).

For the variable for assessment in the area of general coordination and coordination in rhythm, since the Eurofit Testing Battery for the young does not have tests of coordination, this research introduced several tests of coordination as follows:

General coordination variables:

- Bending eights (EIGHTS);
- Steps aside (SAS);

Coordination in rhythm variables:

- Foot and hand drumming (FHD);
- Hops in rhythm (HRIT).

Statistical data processing

All of the data obtained in this research were elaborated by descriptive and comparative statistical methods. In the area of descriptive statistics, the representative central and dispersive parameters were determined: arithmetic means – M and standard deviation – SD, while the *t-test* from the area of comparative statistic procedures was applied and used for the assessment of statistical significance of the arithmetic mean differences. For the comparison of two independent groups of data (the experimental and control group) the *unpaired t-test* was used while the *paired t-test* was used for to compare the arithmetic means of two independent data groups (the experimental and control group) at the initial and final measuring. Statistical data processing was performed by means of the SPSS statistical program.

RESULTS

Based on the obtained results of the descriptive statistics (arithmetic means and standard deviation) shown in Table 1, it can be seen that with the experimental group (E), after an 8-week experimental high-low aerobics program, an improvement occurred in all of the measured variables of the morphological and functional area. In the case of the

control group of female students (K), the results were improved in the following measured variables: body height (BH), body mass (BM), body mass index (BMI), medial calf skinfold (MCS), including an improvement in the Shuttle Run test results.

Table 1 The results of the descriptive statistics and the t-test of morphological features and functional abilities of the E and K group at the initial and final measuring

Variable	Group	N	INITIAL MEASURING				FINAL MEASURING			
			M	SD	t	p	M	SD	t	P
BH	E	16	162.53	5.56	0.4	0.692	162.94	5.94	0.06	0.9526
	K	15	161.66	6.84			162.78	6.57		
BM	E	16	52.66	7.88	-1.23	0.2283	51.09	7.35	-1.86	0.0727
	K	15	55.94	7.19			55.84	7.13		
BMI	E	16	19.87	2.38	-1.75	0.0903	19.20	2.17	-2.18	0.0372 *
	K	15	21.45	2.70			21.11	2.68		
TBS	E	16	15.08	6.64	1.03	0.3112	12.19	4.89	-2.27	0.0306 *
	K	15	12.99	4.70			16.20	5.09		
BBS	E	16	10.73	4.25	1.02	0.3159	8.74	3.18	-1.86	0.0727
	K	15	9.05	6.99			12.31	6.36		
SCS	E	16	11.19	3.66	-1.03	0.3112	10.56	3.56	-1.81	0.0803
	K	15	12.91	5.64			13.44	5.28		
SUS	E	16	16.30	6.64	0.89	0.3805	14.83	5.47	-0.95	0.3497
	K	15	14.13	7.18			17.18	8.26		
MCS	E	16	18.15	6.06	-0.3	0.7662	15.23	4.40	-4.45	0.0001 **
	K	15	18.81	6.64			24.33	6.90		
SHUTTLE RUN	E	16	28.50	4.73	-0.73	0.4711	30.13	4.43	0.07	0.9447
	K	15	29.66	4.16			30.01	4.11		

* level of statistically significant difference 95%

** level of statistically significant difference 99%

Based on the t-test results and the levels of significance (p) shown in Table 1, it can be noted that there were no statistically significant differences between the experimental (E) and control (K) group at the initial measuring. During the final measurement, a statistically significant difference between the experimental and control group was noted in the following variables: body mass index (BMI) and triceps brachii skinfold (TBS) at the 95% level of statistical significance and the medial calf skinfold (MCS) at the 99% level of statistical significance.

Besides the aforesaid, based on the t-test results and levels of significance showed in Table 1, it can be noted that in shuttle run variable, the variable of functional area assessing the maximal oxygen consumption, there were no statistically significant differences between the experimental and control group.

Table 2 The results of the t-test of morphological features and functional abilities for dependent variables of the E and K group at the initial and final measuring.

Variable	Group	N	M INITIAL	M FINAL	Differ.	t	P
BH	E	16	162,53	162,94	-0,41	-1,03	0,3193
	K	15	161,66	162,78	-1,12	-5,2	0,0001 **
BM	E	16	52,66	51,09	1,56	3,18	0,0062 **
	K	15	55,94	55,84	0,10	0,29	0,7758
BMI	E	16	19,87	19,20	0,67	3,49	0,0033 **
	K	15	21,44	21,11	0,33	2,83	0,0127 *
TBC	E	16	15,08	12,19	2,89	3,85	0,0016 **
	K	15	12,99	16,2	-3,21	-3,16	0,0065 **
BBC	E	16	10,73	8,74	1,99	3,53	0,0030 **
	K	15	9,05	12,31	-3,26	-3,03	0,0084 **
SCS	E	16	11,19	10,56	0,63	1,44	0,1704
	K	15	12,91	13,44	-0,53	-1,06	0,3059
SUS	E	16	16,30	14,83	1,48	1,48	0,1596
	K	15	14,13	17,18	-3,05	-3,1	0,0073 **
MCS	E	16	18,15	15,23	2,93	1,77	0,0970
	K	15	18,81	24,33	-5,51	-3,35	0,0044 **
SHUTTLE	E	16	28,5	30,13	-1,63	-7,68	<0,0001**
RUN	K	15	29,66	30,01	-0,36	-4,92	0,0002 **

* level of statistically significant difference 95%

** level of statistically significant difference 99%

The obtained results presented in Table 2, from the area of morphological features and functional abilities, for two dependent data groups, the experimental (E) and control (K) group at the initial and final measuring and based on the t-test results and level of significance (p), indicate that there were statistically significant differences at the 99% level of significance, after the implementation of an 8-week experimental program of high-low aerobics. With the experimental group of female students (E) statistically significant differences were noticed in the following morphological area variables: body mass, body mass index, triceps brachii skinfold and biceps brachii skinfold. In the other examined variables of the experimental group it was noticed that the following variables had decreased values: subscapular skinfold, supraspinal skinfold, medial calf skinfold, while the value of the body height variable increased at the final measuring. However, the measured changes did not lead to statistically significant differences (Table 2). With the participants of the control group (K) the results of the t-test for morphological features indicated that there were statistically significant differences at the initial and final measuring. Statistically significant differences were observed in the following variables: body height, body mass index, triceps brachii skinfold, biceps brachii skinfold, supraspinal skinfold and medial calf skinfold. No statistically significant differences were noted for the other variables. The control group of participants reduced their weight, increased their body height values, while the values of subscapular skinfold variable increased at the final measuring.

Based on the results of two dependent data groups, the experimental (E) and control (K) group, the t-test and level of significance (p), for the Shuttle run variable, which as-

esses maximal oxygen uptake in the area of functional abilities at the initial and final measuring, the obtained results indicate that there were statistically significant differences at the 99% level of significance of.

The results of the descriptive statistics (arithmetic means and standard deviation) from the area of motor abilities presented in Table 3 indicate that the experimental group (E) at the final measuring achieved better results in the measured variables, except in two of the variables (dynamometry and steps aside) with regard to the females from the control group (K). At the initial measuring, based on the t-test results (Table 3), it can be noted that there is a statistically significant difference between the experimental and control group for the following variables: hand tapping, the 10x5m cone drill and hops in rhythm at the 95% and 99% level of statistical significance. Based on the t-test and the level of significance (p) displayed in Table 3, between the experimental and control group at the final measuring, the statistically significant difference is observed in the following variables: the "Flamingo", hand tapping, the sit-and-reach, the 10x5m cone drill, hand and foot drumming, hops in rhythm at the 95% and 99% level of statistical significance level.

Table 3 The results of the descriptive statistics and the t-test of motor abilities of the E and K group at the initial and final measuring

Variable	Group	N	INITIAL MEASURING				FINAL MEASURING			
			M	SD	t	p	M	SD	t	P
FLAM	E1	16	10.31	4.05	0.96	0.3447	7.38	2.73	-2.56	0.0157 *
	K1	15	8.44	6.70			9.88	2.80		
HTAP	E1	16	13.92	2.00	-2.56	0.0157 *	12.77	1.80	-2.38	0.0239 *
	K1	15	16.00	2.56			14.53	2.53		
SAR	E1	16	26.13	5.34	1.83	0.0772	30.63	4.51	3.71	0.0008 **
	K1	15	22.13	5.86			23.25	6.55		
SBJ	E1	16	164.50	13.29	1.29	0.2069	170.75	13.10	1.89	0.0685
	K1	15	156.19	22.02			158.69	21.90		
SU	E1	16	19.31	3.42	1.34	0.1903	21.69	3.20	-0.19	0.8506
	K1	15	17.69	3.44			19.5	3.44		
DHG	E1	16	21.81	4.13	-0.77	0.4473	26.69	4.19	1.86	0.0727
	K1	15	23.13	5.46			27	5.24		
BAH	E1	16	18.65	13.83	1.62	0.1157	21.02	14.64	1.75	0.0903
	K1	15	11.16	12.29			12.58	12.51		
CD-10X5m	E1	16	21.91	1.16	-2.11	0.0433 *	20.63	1.34	-2.08	0.0462 *
	K1	15	23.13	1.99			21.81	1.83		
EIGHTS	E1	16	11.17	1.46	-1.96	0.0593	10.48	1.49	-1.62	0.1157
	K1	15	12.22	1.59			11.36	1.57		
SAS	E1	16	12.53	1.01	-0.64	0.5270	11.93	0.87	-1.71	0.0976
	K1	15	11.23	1.44			10.73	1.45		
FHD	E1	16	10.56	1.82	0.35	0.7288	14.38	2.13	3.7	0.0009 **
	K1	15	10.31	2.24			11.13	2.80		
HRIT	E1	16	15.38	4.36	2.87	0.0075 **	19.65	2.18	3.18	0.0034 **
	K1	15	11.44	3.33			15.75	4.45		

* level of statistically significant difference 95%

** level of statistically significant difference 99%

Based on the obtained results of the comparison of arithmetic means from the area of motor abilities, for two dependent data groups represented in Table 4, the experimental (E) and control (K) group, at the initial and final measuring and based on the t-test results and the level of significance (p), it is noted that there were statistically significant differences in all of the measured variables of motor area at the 99% level of significance. These changes were noted in the following motor area variables: the "Flamingo", hand tapping, the sit-and-reach, standing broad jump, sit-ups, dominant handgrip, the 10x5m cone drill, hand and foot drumming, hops in rhythm. With the control (K) group, only one variable, the "Flamingo" test for the assessment of balance, did not manifest statistically significant differences.

Table 4 The results of the t-test of motor abilities for the dependent samples of the E and K group at the initial and final measuring.

Variable	Group	N	M INITIAL	M FINAL	Differ.	t	p
FLAM	E	16	10.31	7.38	2.94	4.01	0.0011 **
	K	15	8.44	9.88	-1.44	-0.79	0.4418
HTAP	E	16	13.92	12.77	1.16	9.38	<0.0001 **
	K	15	16	14.53	1.47	7.68	<0.0001 **
SAR	E	16	26.13	30.63	-4.5	-13.67	<0.0001 **
	K	15	22.13	23.25	-1.13	-3.74	0.0020 **
SBJ	E	16	164.5	170.75	-6.25	-10.38	<0.0001 **
	K	15	156.19	158.69	-2.5	-3.87	0.0015 **
SU	E	16	19.31	21.69	-2.38	-11.78	<0.0001 **
	K	15	17.69	19.5	-1.81	-17.99	<0.0001 **
DHG	E	16	21.81	26.69	-4.88	-7.49	<0.0001 **
	K	15	23.13	27	-3.87	-6.48	<0.0001 **
BAH	E	16	18.65	21.02	-2.37	-8.42	<0.0001 **
	K	15	11.16	12.58	-1.42	-7.76	<0.0001 **
CD-10X5m	E	16	21.91	20.63	1.28	5.22	0.0001 **
	K	15	23.13	21.81	1.32	8.46	<0.0001 **
EIGHTS	E	16	11.17	10.48	0.68	11.3	<0.0001 **
	K	15	12.22	11.36	0.86	7.81	<0.0001 **
SAS	E	16	12.53	11.93	0.6	7.91	<0.0001 **
	K	15	12.77	12.51	0.26	6.22	<0.0001 **
FHD	E	16	10.56	14.38	-3.82	-23.28	<0.0001 **
	K	15	10.31	11.13	-0.81	-3.9	0.0014 **
HRIT	E	16	15.38	19.69	-4.31	-5.97	<0.0001 **
	K	15	11.44	15.75	-4.31	-11.22	<0.0001 **

* level of statistically significant difference 95%

** level of statistically significant difference 99%

DISCUSSION

After the realization of the experimental high-low aerobics program, significant and positive changes were noticed both in the morphological features and in the functional and motor abilities. Since aerobics exercise to music is featured by making movements and moving the whole body to a certain rhythm, i.e. music, this significant improvement of the results is justified.

After the implemented experimental procedure of aerobics exercise to music, no statistically significant changes of body height and body mass were noted in female 8 graders. The obtained results indicated that the body height of the examined students deviated from the accepted and valid standards for the studied age, although accelerative events were recorded, as well as puberty effects (Radovanović, Raić, Milošević, 1998; Jakonić, Kalajdžić, 2000; Mandarić, 2003; Grego et al., 2006; Grassi, Turci, Sforza, 2006; Erčulj - Bračić, 2009). It is important to mention that body height depends on hereditary factors, while body mass, its reduction, apart from the hereditary factor, is mostly affected by nutrition and physical activity.

The obtained research results in the variable of *body height* are within the values also obtained by other researchers (Jakonić, Kalajdžić 2000; Mandarić, 2003), and it can be concluded that the experimental procedure, as well as the PE instruction, contributes to unhindered growth and development of female 8 graders.

In the *body mass* variable at the final measuring, based on the t-test, no statistically significant difference was noted between the experimental and control group. The participants of the experimental group (E) and control group (K) reduced their body mass. The research results are comparable to other similar studies (Mandarić, 2003; Sekulić, Rausavljević, Zenić, 2003) whose results indicate body mass reduction after the implementation of programmed instruction of high-low aerobics and PE classes.

Programmed instruction of high-low aerobics, with its specific content consisting of aerobic choreography and exercises for the development of the strength of particular muscle groups, applied in the main part of class, had a statistically significant effect on the reduction of the body mass index, triceps brachii skinfold and medial calf skinfold. The quantity of the subcutaneous fatty tissue decreased during the examined age, precisely for the examined variable (TBS - triceps brachii skinfold, MCS - medial calf skinfold), and as a rule they decrease between the ages of 13 and 15. The research results range within the values determined in the studies of other authors who tackled this issue (Martinović, 2002; Sekulić, Rausavljević, Zenić, 2003; Grego et al., 2006; Doder, Savić, Doder, 2007).

Based on the obtained results in the area of morphological features, it can be concluded that aerobic exercise to music based on a high-low aerobics model affects BMI and skinfold reduction, which is considered an improvement in the results. In the morphological area it is possible to recognize changes that occurred with female 8 graders. Namely, genetic predisposition is decisive to the greatest extent when it comes to skeletal dimensions, but is least decisive for subcutaneous fatty tissue. The changes in the skeleton length and body mass can be accounted for, besides the natural development, by the PE classes which stimulate the growth and development of the children in the studied sample. The established changes in subcutaneous skinfold and BMI can be considered changes resulting from an 8-week experimental program, because aerobic exercise to music pursuant to the high-low aerobics model, acts on those dimensions where the possi-

bility of causing change is great. The subcutaneous fatty tissue reduction led to body mass reduction. The analysis results indicated that the offered experimental program was an efficient means for the transformation of morphological features of school age children, so that it can be recommended for application in PE classes in elementary schools.

The results of the investigations of the variables from the area of functional and motor abilities indicated that systematic aerobics exercise to music had a positive effect on the mentioned variables and that particular tasks of aerobic exercise to music were satisfied and realized. The obtained research results ranged within the values of the results reached by other researchers (Pillarella, Roberts, 1996; Brick, 1996; Zagorc et al., 1998; Mandarić, 2003).

The previous, but also the most recent, recommendations of the American College of Sports Medicine (2011), state that exercises carried out 3-5 times a week, lasting for 20-60 minutes in the aerobics regime, lead to an improvement in cardiovascular endurance, i.e. cardiovascular system. That was exactly the case in our research.

The presumption is that there were no statistically significant differences in the shuttle run variable between the experimental and control group, due to the fact that the control group students, in the course of the experimental program attended athletics classes (endurance running, endurance exercises at maximal and submaximal effort), because this kind of exercise is surely adaptable to the body due to the accelerated growth and development phase and stimulatingly affect the body. Maximal oxygen uptake (VO_2max) is significantly correlated with BMI and body fats. Negative relations were found between the BMI and VO_2max in overweight adolescents. With both genders, aerobic fitness decreases with age, especially in female adolescents, therefore it is very important to raise awareness about healthy nutrition and aerobic exercise in the participants of the aforementioned sample.

The analysis of the obtained results of the chosen motor area variables indicates the fact that the consistently realized experimental procedure in PE instruction positively affected certain changes in the studied area. The results indicate that carefully chosen music coverage, with aerobic exercise, not only influences the establishment of a pleasant exercise atmosphere, rhythm and pace of exercise, but also the improvement of motor abilities. The general assessment of the effects of exercise according to the high-low aerobics program shows a statistically significant improvement at the level of the observed variables (Table 3 and Table 4).

The fact is that the experimental program of aerobics exercise to music according to the high-low aerobics model in the experimental group had a great effect on the statistically significant improvement of the results of the investigated variables from the initial to the final measuring in the motor area. A statistically significant improvement of the results was noted in the *flamingo* variable at the final measuring in the experimental group when compared to the control group. The research results showed that there is a statistically significant improvement in the results in the speed of the hand tapping variable, between the initial and final measuring of the experimental group, when compared to the control group. At the final measuring of the experimental group, a statistically significant result improvement was observed in the sit-and-reach variable. The stretching exercises practised by the participants in the experimental group at the final part of the class, certainly affected the result improvement in muscle flexibility of the back tight muscle when compared to the control group.

Based on the research results, no statistically significant improvement in the results of absolute power in the dynamometry variable was recorded, in the explosive leg power of the standing broad jump variable, in repetitive muscle potential in the sit up variable and in the bent arm hang variable for the assessment of static arm and shoulder girdle strength in the experimental group of participants. In terms of the aforementioned variables, the experimental group of participants improved their results at the final measuring, but the difference in comparison to the control group was not statistically significant. The research results indicated that there is a statistically significant improvement in the running speed variable (10 x 5m) between the initial and final measuring of the experimental group. In the variable for coordination in rhythm (hand and foot drumming and hops in rhythm) from the initial to the final measuring, the research results showed that there was no statistically significant improvement in the experimental group. The greatest progress, regardless of the achieved statistical significance, was noted in the variable for coordination in rhythm in the case of the experimental group of female 8 graders when compared to the control group of students. The research results are in agreement with the assertions of Zagorc et al. (2000), that aerobic exercise to music develops almost all types of coordination.

The aforementioned results do not diminish the importance and effects of PE classes, i.e. athletics classes, but indicates the justifiability of the experimental procedure within the PE classes.

CONCLUSION

Generally, it can be concluded that the changes observed after the applied 8-week experimental program of aerobic exercise of high-low aerobics are statistically significant in the examined area of the morphological features, functional and motor abilities of female elementary school 8 graders.

The obtained research results indicate that the programmed instruction of high-low aerobics, as an innovative program in PE instruction can have a positive effect on the transformation of the examined areas, growth, development and health of children, practical applicability, the motivation for work of the students compared to classical and traditional PE instruction, which shows the possibility of applying aerobic exercise to music within regular PE classes. At the same time, the research results refer to a greater possibility of optimization, rationalization and intensification of the teaching process in the sense of operative efficiency of task solving in PE classes.

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EFEKTI PROGRAMA HIGH-LOW AEROBIKA NA MORFOLOŠKE KARAKTERISTIKE, FUNKCIONALNE I MOTORIČKE SPOSOBNOSTI UČENICA OSMIH RAZREDA OSNOVNE ŠKOLE

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Istraživanje je primenjeno na uzorku 31 učenice, osmih razreda osnovne škole „Vožd Karađorđe” iz Leskovca, koje su bile podeljene u dve grupe: eksperimentalnu (N=16) i kontrolnu (N=15). Osnovni cilj istraživanja je bio da se utvrde efekti programirane nastave high-low aerobika na morfološke karakteristike, funkcionalne i motoričke sposobnosti učenica osmih razreda osnovne škole. Efekti programa high-low aerobika praćeni su u prostoru morfoloških karakteristika (osam varijabli), u prostoru funkcionalnih sposobnosti (jedna varijabla) i u prostoru motoričkih sposobnosti (12 varijabli). Eksperimentalni faktor predstavljala je posebno programirana nastava high-low aerobika, koja je trajala osam nedelja i realizovala se u okviru redovne nastave fizičkog vaspitanja. Kontrolna grupa pohađala je program propisan po Nastavnom planu i programu, Ministarstva prosvete Republike Srbije. Rezultati istraživanja su pokazali da je program high-low aerobika, uticao na poboljšanje morfoloških karakteristika, funkcionalnih i motoričkih sposobnosti učenica, u odnosu na učenice iz kontrolne grupe. Rezultati dobijeni istraživanjem ukazuju na pozitivne aspekte high-low aerobika na očuvanje pravilnog rasta i razvoja dece i njegovu praktičnu primenljivost u nastavi fizičkog vaspitanja.

Ključne reči: fizičko vaspitanje, morfološke karakteristike, funkcionalne i motoričke sposobnosti, high-low aerobik.