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Research article

PROGRAMMED PHYSICAL EDUCATION TEACHING AND ITS EFFECTS ON STUDENTS' MOTOR SKILLS

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Abstract. *Nowadays the research of motor skills points to the lack of efficiency of teaching physical education and its effects on the development of motor skills, especially among students of an early school age. The aim of this research was to determine the effects of the applied experimental and current programme of physical education on the motor skills of the first-grade primary school students. The experimental program was carried out on a sample of 185 primary school students (106 students in the experimental group and 79 students in the control group). To determine the effects of the experimental programme a multivariate analysis of covariance (MANCOVA) and univariate analysis of covariance (ANOVA) were applied. Both programmes have effects on the changes of motor skills of students, but the effects of the experimental programme were significantly higher (p = .000). The best effects were achieved in the development of repetitive and explosive strength and segmental velocity among the students of the experimental group. The purpose of the research is reflected in increasing the level of scientific information on the motor skills of students. It can help teachers to plan, program, implement and control the teaching process more rationally and optimally.*

Key words: *school age, physical education, additional exercises.*

1. INTRODUCTION

Motor skills are one part of the overall ability that refers to a certain level of developed basic movable latent dimensions of man, that enable the successful execution of movements, regardless of whether those are specificities acquired by training or not (Kurelić et al., 1975). Development of basic motor skills is provided during all classes of the teaching process

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from the first to the eighth grade of primary school (Kragujević & Rakić, 2004). For the proper development of children and their skills it is essential to increase physical activity, in order to avoid disturbances in the metabolism, cardiovascular diseases and decreased ability in the later period (Riddoch et al., 2004). Sixty minutes of physical activity daily are necessary in order to achieve a positive effect on the body of children. Male students meet these recommendations; however, female students are not active enough and in a later period it can reflect negatively on their health (Strong et al., 2005).

Apart from the competence of teachers, facilities of schools, equipment and requisites are a necessary condition for the successful implementation of physical education. Without proper conditions we cannot expect positive results, not the realization of plans and programmes of physical education to their full extent. Having seen the states of schools and the problems encountered in the classroom, teachers are the ones who increasingly need to find ways to persuade children and youths of the value of physical exercise, to make it a habit for students to exercise, when it is stated as an obligatory or voluntary opportunity to exercise, and when exercise, to stay persistent in it (Matić, Bokan, Bokan, & Perković, 1990). The teacher is obliged to constantly emphasize the importance and value of physical exercise and create a habit among the students to take care of their own body and improve their abilities, so that physical exercise becomes their everyday need. To accomplish this, it is necessary to have: a good preparedness, commitment and motivation of teachers and students for physical education classes, the application of diverse content, greater participation of students in the teaching process, acceptance of their ideas, distribution of responsibilities, subjective sense of students for the competence of teachers, cooperation with students before, during and after exercise, better information about exercising in general, the use of audio-visual means, etc. All those things lead to a sense of satisfaction during physical education classes. Nevertheless, it is important to explain to students how to implement a particular physical exercise program in their free time, out of school.

It is not necessary only to be a good teacher and an eminent demonstrator, but to be a good "diagnostician, forecaster, developer and producer of the program" (Findak, 2003). The statement that students in recent years are lagging behind in development of motor skills we cannot accept calmly, and we have to do everything in order to stop this negative trend. For children, starting school is one of the most important periods in their growth and development. The new environment, a new way of life and the obligations at school and at home can lead to a positive, but also negative effect on development in this period (Sekulić, Krstulović, Katić, & Ostojić, 2006).

Taking into consideration that the early school age represents a period when the process of ossification is in progress, special attention should be paid to strengthening of the back and abdominal muscles, especially the large muscle groups that are important for proper body posture and prevention of deformities. It is necessary to pay attention to the development of the foot and hand muscles, because they are the least developed muscles, which play a very important role in this period. Regular physical activity has a significant effect on the health of children and adolescents, including increased bone mass, maintenance of body weight, reduction of blood pressure for hypertensive adolescents and improving psychosocial behavior (Okely, Booth, & Patterson, 2001).

Research conducted with children of preschool and students of early school age has showed that the current programme of physical education does not cause significant changes in any segment of anthropological status of these children so additional physical

exercise is recommended for them (Babin, Katić, & Vlahović, 1999; Zrnzević, 2003, 2007; Žuvela, Maleš, & Katić, 2008; Pejčić, Malacko, & Muvrin, 2014; Malacko, Stanković, Doder, & Pejčić, 2015). In their free time, physical activity is performed by 44% of students but 56% of students spend their free time in front of computers or in front of TVs and do not have any physical activity, which poses a risk to their health and development (Milanović, Marković, Ignjatović, & Višnjić, 2012). Social networks and computer games affect children so they lose their perception of time and everything that surrounds them in the real world. The consequences are: reduced motor development, association, decreased of emotional development, occurrence of physical deformities, obesity, insufficient sleep, aggressiveness, etc. Physical activity of increased intensity in aerobic conditions provides great health benefits, but activity of moderate intensity for at least 30 min can also be beneficial (obesity). Children and young people aged 5 to 17 years old should have from 60 min to several hours of moderate physical activity per day, and whenever there is a chance to include exercise of greater intensity, to leave a positive effect on the development of the locomotor system (Janssen & LeBlanc, 2010).

There are numerous factors that are correlated to physical activity at an early age. If a child succeeds to master certain movements and create a positive attitude towards physical education and exercise, additional physical activity will help him to improve movement, skills and habits that form the base, and will use them in later stages to overcome the tasks that will await him. Children with poor motor skills should exercise more often and more intensely in order to avoid problems in the later period (Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006). Every physical education class should be a challenge for a pupil, diverse and interesting exercises will contribute to the better motivation and greater involvement of students. It is necessary to have a class that should be similar to training, rather than traditional physical education classes, in order to improve motor skills. That is, motor skill development will be raised to a higher level in this sensitive period, the plateau of development would be longer, and the decline of these skills would be slower (Bala, 1981).

Experimental treatments that have been realized with students of an early school age have shown that well-programmed physical education can have a significant effect on the transformation of morphological characteristics and motor skills of students from the state of a beginner to the desired state (Zrnzević, 2007; Pejčić, Malacko, & Muvrin, 2014; Malacko et al., 2015).

The frequently asked question by experts is whether it is necessary to constantly create new and new experimental treatments, in order to make positive effects on improving the students' skills, or with the greater commitment of those responsible for teaching physical education, it is possible to achieve it with existing programmes. Research has shown that preschool children and first grade primary school students have differences in morphological characteristics and motor skills and that difference is statistically significant (Babin et al., 1999; Zrnzević, 2003; Krsmanović, 1985; Pejčić et al., 2014; Malacko et al., 2015). The boys of preschool age have higher body height and weight, less quantity of subcutaneous adipose tissue and show better results in explosive strength of legs, flexibility, endurance, and coordination to some extent. The girls have increased body volume, better results in the static strength of arms and shoulders, torso strength and endurance (Trajkovski-Višić, Malacko, & Tomljenović, 2011). The experimental programme with the implementation of dance, sports games and gymnastics at preschool age has showed the improvement in the experimental group in running speed, segment speed and coordination (Stupar, Fratrić,

Nešić, & Rubin, 2015). It is necessary to pay equal attention to the development of morphological characteristics and motor skills both with male students as well as with female students (Malacko et al., 2015).

The development of motor skills is understood as a part of the educational process whose success depends primarily on the choice of teaching content. The selection of content and its use should not be aimless exercise, but instead focus on the development of specific skills, particularly in the selection of children for certain individual sports, otherwise, the achievement of desired goal is unreal (Pejčić, 2002). Motor development of children can be as "control parameter" for the acquisition of other developmental functions such as: functional skills but also perceptual or cognitive skills (Piek, Dawson, Smith, & Gasson, 2008).

The aim of this study was to compare two programmes of physical education (experimental and current physical education programme) and their influence on improvement of motor skills of students in primary school.

METHODS

The sample

The experimental programme has longitudinal character, realized in the period of one school year, a sample of 185 first grade primary school students (an experimental group with 106 students and control group with 79 students).

The sample of variables

The tests that equally cover the areas of latent motor skills and mechanisms responsible for performing of certain motor tasks have been applied for the assessment of motor skills of students of the experimental and control groups (Kurelić et al., 1975) (Table 1).

Table 1 Measuring Instruments

Variables	*Motor skils*	*Measuring units*
MTAP – hand tapping	Segmentary speed	number of correct trials
MPOL – backwards field	Body coordination	in s
MS2M – slalom with two medicine balls	Coordination	in s
MDPR – low bend on the bench	Flexibility	in cm
MBAS – standing on one leg	Balance	in s
MKOP – coordination with the baton	Coordination	in s
MSDM – standing long jump	Explosive strength	in cm
M30V – running 30m high start	Speed	in s
MBMD – medicine ball throwing (of 1 kg)	Explosive strength	in cm
MVIS – hanging squirt	Static strength	in s
MDNO – leg lifting while lying on back	Repetitive strength	number of correct trials
MDTR – trunk lifting while lying on back	Repetitive strength	number of correct trials

The description of the applied experimental and control programme

The experimental programme included content from beginner athletics programmes, sports games, ground exercises and equipment exercises, rhythm and dance, with the

obligatory application of additional exercises during every class. The function of additional exercises is to have a positive effect on improving the overall motor and functional skills of students through increased activity during the classes. Basic characteristics of additional exercises: they increase the frequency of the classes, reduce passivity between two exercises, they can be applied in all circumstances, they are suitable for individual dosing, they can be used with children of an early school age (Zdanski & Galić, 2002). Additional exercises significantly influence the increase of the motor skills of students, and should be implemented in physical education (Milanović et al., 2012) (Table 2).

Table 2 Experimental curriculum

September	*October*
Initial measuring (of morphological characteristics, motor and functional skills) – *4 classes*; I athletics programme (walking and running in different ways, different pace, 10m and 20m sprint, persistent running in nature, long jump with approach and from the spot, running – high start, basic games with running) – *9 classes*; Additional exercises – *on every class*.	Sport games – basketball and handball (operating with the ball in different ways, in pairs, with left or right hand, by hitting vertical and horizontal targets, basic games with elements of basketball and handball) – *5 lessons*; Athletics (rope jump, running 20m, space-oriented running, interval method running, high jump with approach, high jump from the spot, constant running) – *8 classes*.
November	*December*
Athletics (constant running up to 4min, medicine ball throwing 1 and 2 kg, throwing at horizontal and vertical goals, relay games with running, basic games with running) – *4 classes*; Sports Games (ball handling around obstacles, mini basketball, ball handling around obstacles with scoring a goal, basic games with the elements of handball, playing dodgeball) – *7 classes*.	Sports Games (games with the elements of basketball, handball, volleyball) – *3 classes*; Rhythm and dance (rhythmic walking and running, child leap, active expression with music, children folk dance) – *5 classes*; Gymnastics (forward and backward rolls, scale, candlestick, knee scale, turns, bridge stretch) – *5 classes*.
January	February
Rhythm and dance (side gallop, children folk dance) – *2 classes*; Gymnastics (vaulting horse jump, rope climb, combined hang, equipped area exercises) – *6 classes*.	Gymnastics (low beam, balance beam, hang rings) – *4 classes*; Rhythm and dance (side gallop, children folk dance) – *2 classes*.
March	*April*
Gymnastics (ground and equipment combination of elements and exercises, handstand, forward and backward rolls) – *7 classes*; Rhythm and dance (children folk dance) – *2 classes*; Sports Games (basketball, handball, volleyball) – *4 classes*.	Athletics (20m and 30m sprint, constant running, medicine ball throwing, high jump and long jump, relay and basic games with running) – *4 classes*; Sports Games (basic games with the implementation of volleyball, basketball, handball) – *7 classes*.
May	*June*
Athletics (basic games with running, interclass championships, medicine ball throwing, high jump, long jump, running 20m) – *6 classes*; Sports Games (basketball, volleyball and handball – class and interclass championship) – *5 classes.*	Athletics (agility and speed exercises on equipped area, basic games with running, running 30m) – *4 classes*; Sports Games (basketball, volleyball and handball – championship) – *2 classes*; Final measuring (of morphological characteristics, motor skills, functional skills) – *4 classes.*

The control group programme contains: natural movement exercises, elementary games, exercises with requisites, exercise on the ground, balance exercises, rhythmic exercises and folk dances (The Rulebook for the first and second year of elementary school education curriculum, 2004).

Data processing methods

In order to determine possible group differences for the initial measurement in motor skills, a multivariate analysis of variance (MANOVA) was applied, while the intergroup differences individually for each variable is identified by a univariate analysis of variance (ANOVA).

Determining the effects of the applied experimental programme of physical education has been performed using the multivariate analysis of covariance (MANCOVA), while single intergroup differences for the variables have been determined by the univariate analysis of covariance (ANCOVA). Applying these analyses is offset by any possible differences at the initial measuring of the examined groups, while determining any differences is done by partial averages (Adj. Means) at the final measuring.

RESULTS

It can be noted that the value of Wilk's Lambda is .827, the value of the F test is 1.47, which indicates that there is no statistically significant intergroup difference (p = .153) (Table 3).

Table 3 Multivariate differences of motor skills between the experimental and control groups of students at the initial measuring

Wilk's Lambda	F	Effect df_1	Error df_2	p
.827	1.47	12	84	.153

Wilk's Lambda – Wilks' lambda test; *F* – F-test; df_1 – the first level of freedom (numerator); df_2 – the second level of freedom (denominator); *p* – the level of significance between groups in the entire space of variables.

Table 4 shows the results of the multivariate analysis for repeated measures of the variance of the motor abilities of the experimental group of students. After the administration of the experimental programme there have occured statistically significant changes at a multivariate level (p = .000).

Table 4 Multivariate differences between the initial and final measurements (MANOVA – repeated measure) of motor abilities in experimental group

Wilk's Lambda	F	Effect df_1	Error df_2	p
.016	225.17	12	44	.000

Wilk's Lambda – Wilks' lambda test; *F* – F-test; df_1 – the first level of freedom (numerator); df_2 – the second level of freedom (denominator); *p* – the level of significance between groups in the entire space of variables.

Table 5 shows the results of the univariate analysis for the repeated measures of motor abilities in the control group.

Table 5 Univariate differences between the initial and final measurements (ANOVA – repeated measure) of motor abilities of the control group

Test	Mean of Initial measurement	Mean of Final measurement	F (1.40)	p
MTAP	9.90	12.85	155.42	.000
MPOL	28.50	26.07	10.95	.002
MS2M	37.34	33.99	13.84	.001
MDPR	30.66	31.41	12.75	.001
MBAS	16.83	14.69	2.80	.102
MKOP	5.90	5.74	.90	.348
MSDM	109.22	114.51	39.66	.000
M30V	7.12	6.83	12.46	.001
MBMD	250.61	265.24	31.44	.000
MVIS	10.46	11.24	.38	.542
MDNO	10.98	12.00	2.03	.162
MDTR	8.10	7.46	.86	.359

MTAP – hand tapping; *MPOL* – backwards field; *MS2M* – slalom with two medicine balls; *MDPR* – low bend on the bench; *MBAS* – standing on one leg; *MKOP* – coordination with the baton; *MSDM* – standing long jump; *M30V* – running 30m high start; *MBMD* – medicine ball throwing (of 1 kg); *MVIS* – hanging squirt; *MDNO* – leg lifting while lying on back; *MDTR* – trunk lifting while lying on back; *F* – F-test for univariate analysis of variance; *p* – the level of significance between groups in the entire space of variables.

Based on the results obtained by the multivariate analysis of covariance (MANCOVA) and based on the results of Wilk's Lambda (.117) and the results of the F test (45.18), it is clear that the system of applied variables for motor skills assessment indicated a statistically significant difference (p = .000) between the experimental and control groups of students at the final measuring (Table 6).

Table 6 Multivariate differences in motor abilities between the experimental and control groups in final measurement with the neutralistion of differences in the initial measurement (MANCOVA)

Wilk's Lambda	F	Effect df_1	Error df_2	p
.117	45.18	12	72	.000

Wilk's Lambda – Wilks' lambda test; *F* – F-test; df_1 – the first level of freedom (numerator); df_2 – the second level of freedom (denominator); *p* – the level of significance between groups in the entire space of variables.

The most remarkable differences were noted in the variables: trunk lifting in prone position (MDTR), the standing long jump (MSDM), leg lifting while in prone position (MDNO), hand tapping (MTAP), 30m run with a high start (M30V), standing on one leg (MBAS), hanging squats (MVIS) and a two-medicine ball slalom (MS2M).

Table 7 Univariate differences in motor abilities between the experimental and control groups in the final measurement with the neutralisation of differences in the initial measurement (ANCOVA)

Test	Adj. Mean E	Adj. Mean K	F (1.83)	p
MTAP	15.06	12.80	78.04	.000
MPOL	21.37	26.45	27.15	.000
MS2M	29.65	34.79	35.92	.000
MDPR	33.97	31.73	24.71	.000
MBAS	35.76	17.01	63.62	.000
MKOP	4.90	5.76	28.92	.000
MSDM	126.59	114.17	107.18	.000
M30V	6.28	6.85	64.34	.000
MBMD	291.70	263.54	23.14	.000
MVIS	21.60	11.40	40.97	.000
MDNO	19.74	11.54	81.09	.000
MDTR	15.85	6.88	119.10	.000

MTAP – hand tapping; *MPOL* – backwards field; *MS2M* – slalom with two medicine balls; *MDPR* – low bend on the bench; *MBAS* – standing on one leg; *MKOP* – coordination with the baton; *MSDM* – standing long jump; *M30V* – running 30m high start; *MBMD* – medicine ball throwing (of 1 kg); *MVIS* – hanging squirt; *MDNO* – leg lifting while lying on back; *MDTR* – trunk lifting while lying on back; *E* – experimental group; *K* – control group; *F* – F-test for univariate analysis of variance; *p* – the level of significance between groups in the entire space of variables.

DISCUSSION

The use of experimental programme has contributed to the improvement of all the motor skills of students of the experimental group. The greatest difference between the groups as found in repetitive strength of the torso (MDTR) and legs (MDNO), explosive strength of legs (MSDM) and segmental speed (MTAP), which confirms the results of the F- test.

The fact that no movement, or the motion, can be performed without a larger or smaller contribution of strength, has caused the strength to be the most common subject of studies and has always been of great importance.

The highest pace of relative strength development is over a period from six to seven years old. From the age of seven to the age of eight the strength of most muscle groups in male and female children is the same, but after that period boys become stronger. It is recommended to have exercises of mid and submaximal intensity (Kragujević & Rakić, 2004).

Since the passive elements of the locomotor apparatus in this period are not solid enough and they are characterized by muscular weakness, especially of the torso and upper extremities, increased physical activity, well-selected contents, the frequency of work and age-appropriate equipment are essential. The most suitable exercises for strength development in early years of primary school children are: shaping exercises, exercises which overcome the person's own weight, lifting and moving the whole body or individual parts, weight exercises, mutual carrying of equipment, jumps, throwing, climbing with vertical and slope obstacles, acrobatics, pair exercises (Zrnzević, 2016).

The coefficient of inheritance with the static and repetitive strength is about 50%, so the adequate exercises can double the result and allow the transformation of these skills throughout one's whole life (Malacko, 2002). The main task of repetitive exercises for students of an early school age is to improve large muscle groups of the back and

abdomen, shoulder and legs, in order to ensure the suitable body posture and to strengthen muscle groups that are not engaged in everyday activities.

In the control group of students the improvement of motor skills is significantly lower because at the final measuring, there was a significant stagnation in repetitive strength (MDTR) compared to the initial measuring. The main reason for the decline of repetitive and static strength can be a lack of motion, obesity, nerve tension, and its decline is more noticeable than the explosive strength because the inheritance is lower. At school, the effects of development of repetitive and static strength are very low, the effective exercise time of students is only about 12 minutes during class (Krsmanović, 1996). For this reason, the development of motor skills of students from 7 to 11 years old should be directed to the development of those skills that can do more to transform themselves and are less genetically conditioned. Otherwise the skills will not be developed to the desired level (Pejčić & Malacko, 2005).

Unlike repetitive and static strength, explosive strength is largely an innate skill (80-85%) and its development should start very early, in the fifth or sixth year when the possibility of development is much higher, and its increase is possible to achieve by organized and systematic exercises (Malacko, 2002). The sample included in this study is extremely important for the development of explosive strength, which has been confirmed, as the students of the experimental group achieved significantly better results on explosive strength tests (MSDM, MBMD) than the students of the control group. The development of explosive strength is especially important for sports where explosive strength plays a decisive role. In our schools, students are lagging behind in the development of explosive strength, and the most common reasons are: poor level of activity in the period of most intense development, and physical education not being on a satisfactory level or not programmed based on scientific knowledge.

The students of the experimental group showed results on tests of measuring coordination skills which are different in a statistically significant manner compared to the control group (MPOL, MS2M, and MKOP). Coordination is genetically conditioned by over 80% (Malacko, 2002), which supports the fact that programmed teaching has enough content that has contributed to a significant improvement of the coordination of the experimental group of students. The basic definition of coordination is the ability to manage the body in space and time (Berković & Krsmanović, 1999). The development of coordination depends largely on previous experience; the larger the skills fund, the easier to handle new motions is; the more complicated the motor task, the greater the coordination. Out of all motor skills, coordination has the highest correlation with intelligence. With no doubt coordination is the most important motor skill, which is implemented in the structure of every movement, from the simplest to the most complex forms of motions (Purenović-Ivanović, Popović, Stanković, & Bubanj, 2016).

Children of this age show great ability for rapid adoption of new, more complex movements. It is noticeable that the control group of students have decreased the test results for the assessment of coordination compared to the initial measuring (MPOL, MS2MD).

On the speed tests (MTAP, M30V) the students of the experimental group have made significantly better results than the students of the control group, despite the fact that the initial measuring has not showed a statistically significant difference in the speed. Speed as a motor skill to its full extent is genetically conditioned (90%), which means it can be improved only slightly (Malacko, 2002). For this reason, it is necessary to start its development at a preschool age between the age of three and four by improving, above all, the natural forms of movements. In early primary school, in addition to short-distance

running, speed in class can be developed throughout the usage of different polygons with certain tasks and throughout elementary games that are based on the development of speed; this method is more effective and interesting for children. Speed is correlated to other abilities, so with the development of strength and coordination, speed can be greatly improved. According to Krsmanović (1985), it was found that during short sprints strength is three times more involved than the speed.

The smallest but statistically significant difference in favor of the experimental group students is achieved on the balance test (MBAS) (F = 13:16). The establishment and keeping of balance is of great importance, therefore its development should begin as early as possible, because it is largely conditioned by the genetics (90%), but it is also influenced by the environment (Malacko, 2002). The balance is the ability of the body to effectively resist the action of the force of gravity in different situations and positions (Sekulić & Metikoš, 2007).

The programme of physical education for the younger and older school children predicts plenty of activities where the balance is the dominant characteristic and that can influence the improvement of balance. Children do not have a great ability to keep balance in a static position, which probably caused poor results on the initial measuring and less effect on the final measuring for the control group of students but also the inappropriate realization of the educational content that improve balance. Its development can be caused effectively through the courses which disturb balance (ground exercises and equipment exercises, walking on the narrowed area, equipped area exercises, and basic games).

Male students, studies have shown it, achieve better results in explosive and repetitive strength and coordination, but female students on the test of flexibility. Development is more intense in boys (Zrnzević, 2003; Pejčić et al., 2014).

A semi-experimental study conducted among third graders, using purposefully chosen exercises, has showed statistically significant difference in favor of the experimental group in locomotor skills ($p < 0.05$), manipulative skills ($p < 0.001$) and overall motor development ($p < 0.001$). Applied exercises can be used in making educational plans for elementary school third graders to improve student motor skills (Bakhtiari, Shafinia, & Ziaee, 2011).

When checking the effects of the two programmes between the initial and final measuring, it is realized that the effects that were made by the experimental programmes on motor skills of students are much greater than the effects that were provided by the current curriculum that did not contain enough exercises to develop all the skills equally, or it is not realized adequately in all segments. The increased level of physical activity among students contributes to the development of aerobic endurance, flexibility, explosive and static strength and balance (Babin, Katić, Ropac, & Bonacin, 2001).

CONCLUSION

Final measuring results have showed statistically significant difference between the students of experimental and control groups at the multivariate level ($p = .000$). At the univariate level the significant difference is confirmed in all investigated variables at the significance level of $p = .000$. The biggest difference between the groups has been found in repetitive strength of the torso (MDTR) and legs (MDNO), explosive strength of legs (MSDM) and segmental speed (MTAP). According to the obtained results it is important to emphasize that in the early school age it is necessary to work equally on the development of motor skills, especially those that are largely genetically determined and where possible

changes can be done. Motor skills are increasing due to population growth, but the increase in the level of motor skills of the experimental group of students is the result of the implementation of the experimental programme whose effects are much more indicative. The obtained results can be used in the planning and programming of physical education.

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PROGRAMIRANA NASTAVA FIZIČKOG VASPITANJA I NJEN UTICAJ NA MOTORIČKE SPOSOBNOSTI UČENIKA

Istraživanja motoričkih sposobnosti u poslednje vreme ukazuju na nedovoljnu efikasnost nastave fizičkog vaspitanja i njen uticaj na razvoj motoričkih sposobnosti, posebno učenika mlađeg školskog uzrasta. Cilj istraživanja bio je utvrditi kakvi su efekti primenjenog eksperimentalnog i aktuelnog programa fizičkog vaspitanja na motoričke sposobnosti učenika prvog razreda osnovne škole. Eksperimentalni program realizovan je na uzorku od 185 učenika (106 učenika eksperimentalne grupe i 79 učenika kontrolne grupe)osnovne škole. U kontrolnoj grupi nastava je realizovana po aktuelnom nastavnom Planu i programu. Za utvrđivanje efekata eksperimentalnog programa primenjene su multivarijantna analiza kovarijanse (MANKOVA) i univarijantna analiza kovarijanse (ANKOVA). Oba programa delovala su na promene motoričkih sposobnosti učenika, ali su efekti eksperimentalnog programa značajno veći (p= .000). Najveći efekti ostvareni su u razvoju repetitivne i eksplozivne snage i segmentarne brzine kod učenika eksperimentalne grupe. Vrednost ovog istraživanja ogleda se u povećanju nivoa naučnih informacija o motoričkim sposobnostima učenika. Može pomoći da nastavnici i učitelji racionalnije i optimalnije planiraju, programiraju, sprovode i kontrolišu nastavni proces.

Ključne reči: *školski uzrast, fizičko vasptanje, dopunske vežbe*