Croatian Journal of Education
Vol: 15 (1/2013), pages: 129-152
Preliminary communication
Paper submitted: 12th April 2012
Paper accepted: 3rd September 2012

Organisation of Physical Activities as a Precondition for Quality Development of Motor Abilities of School Children

Živorad Marković and Emina Kopas-Vukašinović
Faculty of Education in Jagodina, University of Kragujevac

Abstract

In their work the authors consider the significance of organizing physical activities for the development of school children's abilities. Led by the theoretical basis that physical development of children represents a basis for their entire development, and that fine motor skills are determined by the development of gross motor skills, the authors point to the significance of content and structure of the physical education programme for lower primary school grades. It is evident that the effects of cultivating children's development during the preschool period can be seen in lower primary school classes. The goal of this research was to determine if and how much a different organization of the preparatory part of the physical education lesson for younger school children determines the differences in the development of their motor abilities. Using the experimental method, the effects of a prolonged preparatory part of a lesson in younger school classes were tested. This part was realized through a series of exercises which were supposed to have an influence on the transformation of motor abilities in relation to the structure with a standard duration of certain parts of the lesson. It was determined that a certain increase in pupils' body movement during a physical activity can significantly contribute to the better development of motor abilities. These abilities determine proper physical development and improvement of health, which is the general aim of physical education.

Key words: *lesson structure; preparatory part of physical education lesson; physical education programme*

Introduction

Through a unique system of practice in preschool institutions and in schools, the motor abilities of children (pupils) determine their development in all aspects. Because of this, it is important to adequately plan and organize everyday physical exercise that is in accordance with children's age, psychophysical characteristics of their development and individual abilities. Considering that it has been established that children at a young age rapidly develop their motor abilities and that this development is genetically predetermined, regular and properly applied physical activity of a child contributes to the development of more complex motor abilities. One of the most important functions of preschool education is to prepare children for school, which implies a preparation of their motor abilities (development of gross motor skills, fine motor skills and graphomotor skills). Young school children develop motor skills through an appropriately structured physical education lesson. However, it is important to consider different possibilities for the structure of these lessons. One of the possibilities is organizing a prolonged preparatory part of the physical education lesson by introducing additional series of exercises for pupils which could have an influence on the transformation of their motor skills. It is possible to monitor the effects of that kind of a lesson structure through pupils' results in the domain of the quality of these skills.

Significance of Physical Education for Preschool and School Children

The common goal of physical education in preschool programmes and in schools has been the strengthening of health, appropriate physical development and providing grounds for a healthy physical constitution. Even in the very first preschool programmes in Serbia introduced at the end of the 19th century, the education of preschool children had as its goal the development of child's body, senses and spirit, to keep children away from bad influences and accidents, strengthening a child's organism and improving physical development (Kopas-Vukašinović, 2010). This implied the establishment of a foundation for a healthy physical constitution and gradual complexity of physical activities of preschool and school children. During that time there was a demand in the curricula of national schools for introducing gymnastics, swimming, excursions and children's games with the aim of protecting and strengthening their health.

From those goals established through physical activities in preschool institutions and schools the tasks of physical education were realized, in relation to the development of healthy, physically good and properly developed children, who will gradually master their motor skills, develop their senses and physical abilities like safety, skilfulness, and harmony of motor skills, to the formation of a habit for everyday physical exercise. When physical abilities of school children are considered, it should be highlighted

that they are significantly genetically determined and influenced by the laws of their physical development (Panić, 1999).

Motor development of a preschool child is determined by the cephalous-caudal and proximo-distal direction of its development. This implies that adequate development of "gross motor skills" of a preschool child contributes to the qualitative development of "fine motor skills", which enables them to have precise and fine movements at an older age (Ackermann, 2004; Fine Motor Development…). Because of that "exercises of expansion" for preschool children have a special place in the methods of instruction for the realization of physical activities as they initiate "the development of their trunk, shoulders, hips and muscles" (Fine Motor Development…).

The fact is that physical development of a child represents a basis for the development of the child's total potential. Therefore, it is not coincidental that among physical education tasks, the preschool and school programmes also focus on the development of positive personal characteristics, strengthening of self-confidence, development of cognitive abilities, cultivation of positive emotions and strengthening pro-social behaviour of children. These tasks are in effect even today as part of the previously mentioned programmes.

Carrying out the physical education tasks for preschool and school children, in relation to all aspects of their development, determines the complexity of the organization of physical activities with children (targeted activities in preschool institutions and programme activities at school). It is determined that adequately organized physical exercises of children (pupils) implies their preparation for more complex physical activities at a school age, which contributes to the strengthening of their motor skills. Physical education has been the subject of research of many foreign and domestic theoreticians and researchers with respect to the work with preschool children from different body, perceptive and health hygienic activities which initiate motor development from rudimentary abilities of movement, exercise and acquisition of basic child movements, up to general and specific abilities of movement (Kamenov, 1999; *Ministarstvo prosvete i sporta Republike Srbije*, 2006). The structuring of physical activities in preschool institutions means considering their adequacy to age and individual abilities of children according to the nature of their development, as well as their needs for movement, with the aim of acquiring motor skills. When referring to the organization of physical activities of school children, they are systematized in the lessons, starting from the optimal level of physical development of a pupil. Goals and tasks of pupils are determined in relation to improving the already developed general abilities for movement (speed, strength, endurance…) followed by the development of specific abilities for movement according to the potentials of each individual pupil. The contents of the physical education programme are presented in three thematic areas: development of physical ability, sport technical education and the relationship between physical education with life and work.

It is evident that adequate organization of educational activities at school implies an appropriate time articulation of the planned activities with pupils. Mercurialis researched the structure of physical education lesson in the 16th century. In his book *Gymnastics Skills,* he divided the concept of a gymnastics lesson into three parts: preparatory, basic and final part. Since then, different authors have determined in different ways the physical education lesson structure (exercises). According to Ling, an exercise lesson has five parts and these are: regular exercises, preparatory movements, basic (main) exercises, applied exercise and exercises for appeasement. The timing of each part of the lesson is determined according to the pupil's age and the time of the lesson (Ilić and Mijatović, 2006). At the beginning of the 20th century, with the aim to adapt the scheme of physical education lesson to the demands of modern education conceptions, Linhart suggested shortening the time for pupils' exercise (Milanović, 1986). Today, prominent methodologists of physical education indicate the possibility of flexible time articulation of some lesson parts, which can last differently, determined by special structuring of lessons (Arunović, 1982; Milanović, 1986; Findak, 1999; Marković and Višnjić, 2008; Matić, 1978; Mejovšek, 1962; Rodić, 2000; Tripković, 1983; Višnjić, Miletić and Jovanović, 2004). It is clear that the lesson structure should not be understood as a scheme, as a "recipe" which would be applied always and in every situation (Krsmanović and Berković, 1999).

It is a fact that different structuring of a lesson can determine children's results in physical activities. Therefore, we started from the statement that organization of physical activities can be a significant starting point of qualitative development of motor skills among children in preschool institutions and schools.

Research Methodology

Research Aim

The aim of this research is to determine whether and to what extent a different organization of the preparatory part of the physical education lesson for younger school children, determines differences in the development of their motor skills. This primary goal of the research has the following sub-goals: a) evaluate *the effects of a prolonged preparatory part of physical education lesson* realized by a series of exercises which could influence the transformation of pupils' motor skills; b) evaluate *the effects of the application of the additional exercise* for pupils in a prolonged preparatory part of a lesson in relation to the development of their essential physical characteristics and bigger muscle zones.

Research Tasks

1. Evaluate the level of motor abilities of pupils in the experimental and control group (initial and final evaluation).
2. Determine the significance of difference between the experimental and control group of pupils in the initial and final evaluation in relation to motor skills.

3. Determine the significance in the difference of the effects of the experimental and control treatment in relation to the state of motor abilities.

Methods and Procedures, Place and Time of Research

The research was of a longitudinal experimental character. A pedagogical experiment was applied with parallel groups.

The research was carried out at the "Jovan Jovanović Zmaj" primary school in Svilajnac, the Republic of Serbia, in the first term of 2010/2011 school year. The experiment included grade four pupils and covered 35 lessons each with a duration of 45 minutes. The time of exercise was equal for the control and experimental group.

The Course of Research

An initial evaluation took place during the first two lessons of regular physical education teaching. After the initial evaluation, the 30-lesson treatment began. The experimental treatment consisted of a prolonged preparatory part of the physical education lesson, which was named the "obligatory part" and it was aimed at improving pupils' motor skills. In addition to the obligatory series of shaping exercises, which lasted five minutes, the preparatory part took ten more minutes of organized activities which were meant to have an influence on the transformation of pupils' motor abilities. The series of shaping exercises changed every ten lessons. In the first series pupils did the exercises individually. The second series consisted of exercises in pairs, and the third series consisted of shaping exercises using equipment (balls, punts, rods…). After the series which consisted of 8 to 10 shaping exercises, the "obligatory part" of the preparatory part of the lesson was realized.

The programme of additional exercise consisted of organized strength exercise. This programme was divided according to the topology criterion. This means that during one week the exercises for arms, shoulders and torso were carried out in one lesson. The second lesson covered exercises for the torso and legs, and the third lesson included exercises for the arms, shoulders and legs. With this dynamics all the larger muscle zones were subjected to an intensive workload twice a week. In addition to the topology criterion, the exercises in the "obligatory part" of the preparatory part of the lesson were organized for the purpose of strengthening those muscle areas which were less engaged during the main part of the lesson. These exercises are organized as additional exercises in relation to primary exercise during the main part of a lesson.

During intensive work (exercising) pupils were given instructions on the correct initial posture, movement amplitude, repetition number in one series, number of series, character and length of a break between series and proper breathing during the exercises. In this way, pupils acquired a certain corpus of theoretical knowledge which will be used for individual exercising during extracurricular activities. The pupils' age conditioned that all contents were planned so that the load in exercises is represented by gravity force, own body, resistance of a partner with similar abilities and equipment for a certain age.

The control group of pupils worked (exercised) according to the traditional physical education lesson structure. In the control group, the preparatory part of a lesson lasted seven to ten minutes and consisted of a series of eight to ten shaping exercises without the "obligatory part".

For the evaluation of motor ability, six standard motor tests were applied - "*Eurofit*" battery (Kukolj et al., 1993). All motor tests were carried out under standard conditions of a physical education gym.

During the tests the plan for the realization of motor abilities was: plate tapping (EFTA), - for the evaluation of segmentary hand speed; 10x5 meter shuttle run (EFAG) - for the evaluation of speed - agility; a 30 metre running (EFSB) - for the evaluation of sprint speed; sit-ups for 30 seconds (EFLS) - for the evaluation of repetitive strength of stomach muscles and flexors in hip joint; bent arm hang (EFZG) - for the evaluation of isometric force of upper body part and flexors in elbow joints; standing broad jump (EFSK) - for the evaluation of explosive strength of extensor leg muscles.

Statistical Data Processing

The data which were acquired by this empirical research were processed by the use of certain statistical procedures. Using descriptive statistics for each variable the arithmetic mean was calculated (M); standard deviation (Sd), minimal result (Min); maximal result (Max); variation coefficient (Cv); trust interval (Interv. pov.); the degree of curve inclination - skewness (Skew), the degree of curvation of the top of the curve - kurtosis (Kur) and Kolmogorov - Smirnov test (KS-p).

In order to test the significance of differences of arithmetic means for each group, a multivariate analysis of variance (Manova) and discriminant analysis were applied. For the significance of differences of variables univariate analysis of variance was applied (Ancova).

In order to test the significance of differences of the effects of the treatment a univariate analysis of covariance was applied (Ancova).

Research Sample

In this research, as part of the experimental treatment, 56 fourth grade primary school pupils were involved. They were divided into experimental group (26 pupils) and control group (30 pupils). All pupils were healthy and fit for the physical education lessons. During the experimental treatment their absence was not higher than 10% of the total number of planned physical education lessons. During this research they did not participate in any other active physical exercise. A complete initial and final evaluation of motor abilities was done for these pupils.

Results and Interpretations

In accordance with the planned goal and methodological approach, the motor skills of the experimental and the control group were researched in the initial and final evaluation, as well as under the experimental and control treatment.

a) Motor abilities of experimental and control group pupils (initial and final evaluation)

Table 1. *Descriptive indicators of the experimental group of pupils on the initial evaluation*

Varia-bles	M	Sd	Min	Max	Cv	Interv.	Pov.	Skew.	Kurt.	KS-p
EFTA	128.15	13.18	109.0	158.0	10.28	122.83	133.48	.66	-.35	.371
EFAG	228.96	40.14	181.0	299.0	17.53	212.75	245.18	.58	-1.07	.103
EFSB	55.65	3.46	50.0	64.0	6.22	54.26	57.05	.72	-.18	.303
EFLS	22.42	2.74	17.0	27.0	12.24	21.31	23.53	.13	-.83	.539
EFZG	204.62	164.98	10.0	540.0	80.63	137.96	271.27	.43	-1.11	.224
EFSK	139.08	17.42	100.0	168.0	12.52	132.04	146.11	-.62	-.12	.995

Legend: M - arithmetic mean; Sd - standard deviation; Min - minimal results; Max - maximal results; Cv - coefficient of variation; Interv. pov. - trust interval; Skew. - the degree of curve inclination; Kurt - the degree of curvation of the top of the curve; KS-p - Kolmogorov-Smirnov test.

As can be seen from *Table 1,* the initial evaluation results of the experimental group's motor skills do not differ from the optimal indicators for their age.

Table 2. *Descriptive indicators of the control group of pupils on the initial evaluation*

Varia-bles	M	Sd	Min	Max	CV	Interv.	Pov.	Skew.	Kurt.	KS-p
EFTA	129.07	12.65	104.00	151.00	9.81	124.34	133.79	.28	-.92	.407
EFAG	224.13	38.85	184.00	295.00	17.33	209.63	238.64	.79	-1.15	.006
EFSB	55.90	3.13	50.00	62.00	5.61	54.73	57.07	-.10	-.45	.798
EFLS	22.67	2.83	17.00	27.00	12.50	21.61	23.73	-.14	-1.14	.465
EFZG	319.30	219.73	10.00	670.00	68.82	237.23	401.37	.06	-1.30	.699
EFSK	143.47	16.66	108.00	170.00	11.61	137.24	149.69	-.52	-.40	.998

Looking at the data in *Table 2* it can be seen that the results of the initial evaluation of motor skills of the control group of pupils also do not differ from the optimal indicators for their age. Through further analysis of the results from the initial evaluation of motor abilities of pupils in the experimental and control group, the difference can be noticed between arithmetic means. In the initial evaluation the experimental group had, on average, better results in plate tapping (EFTA) for 0.92 s, in a 30 metre running (EFSB) for 0.35 s, in the activity "sit-ups for 30s" (EFLS) for 0.25 repetitions. In the initial evaluation the control group of pupils had, on average, better results in 10x5 meter shuttle run (EFAG), for 4.83 s, in activity "bent arm hang" (EFZG), for 114.68 s, in standing broad jump (EFSK), for 4.39 cm.

Table 3. *Descriptive indicators of the experimental group of pupils on the final evaluation*

Varia-bles	M	Sd	Min	Max	Cv	Interv.	Pov.	Skew.	Kurt.	KS-p
EFTA	116.00	6.78	102.0	125.0	5.84	113.26	118.74	-.39	-1.22	.533
EFAG	204.27	32.38	170.0	280.0	15.85	191.19	217.35	1.16	.01	.028
EFSB	53.27	3.70	48.0	62.0	6.95	51.77	54.77	.74	-.40	.350
EFLS	25.23	2.32	20.0	29.0	9.20	24.29	26.17	-.23	-.31	.285
EFZG	318.23	182.00	26.0	649.0	57.19	244.70	391.76	.29	-.99	.608
EFSK	147.92	14.76	119.0	178.0	9.98	141.96	153.89	-.12	-.54	.955

The experimental treatment had a positive effect on the experimental group of pupils which resulted in the improvement of average results for all of the six variables. The improvement of average results was determined for plate tapping (EFTA) for 1.17 s; in 10x5 meter shuttle run (EFAG) for 2.47 s; in a 30 m running (EFSB) the results were better for 0.24 s; in activity "sit-ups for 30s" (EFLS) results were better for 2.81 repetitions; in activity "bent arm hang" (EFZG) the improvement was for 11.36 s; in standing broad jump (EFSK) the result was better for 8.84 cm. The highest deviation from the mean value was for the activity "bent arm hang" with values of 164.98 in the initial and 318.23 in the final evaluation.

It is relevant to mention that the skewness values with a negative mark indicate a particularly positive asymmetric curve. The value of kurtosis is less than 3.00 which determines the model of leptokurtic curve which then states that the results are homogenous.

The results of Kolmogorov-Smirnov test show that the distribution of values for the results of researched variables in the initial and final evaluation are within the frame of a normal distribution (*Table 1, Table 3*).

Table 4. *Descriptive indicators of the control group on the final evaluation*

Varia-bles	M	Sd	Min	Max	Cv	Interv. Pov.		Skew.	Kurt.	KS-p
EFTA	126.10	11.41	102.0	150.0	9.05	121.84	130.36	.11	-.55	.971
EFAG	322.87	545.27	180.0	3202.0	168.88	119.21	526.52	5.15	24.73	.000
EFSB	54.90	5.71	29.0	63.0	10.41	52.77	57.03	-3.10	12.36	.152
EFLS	22.83	2.79	19.0	28.0	12.23	21.79	23.88	.27	-1.44	.139
EFZG	313.47	219.98	10.0	703.0	70.18	231.30	395.63	.22	-1.20	.870
EFSK	144.13	16.92	100.0	173.0	11.74	137.81	150.46	-.69	.22	.996

The control group of pupils taught under a traditional structure of physical education lesson had effects on the improvement of average results in four out of the six variables researched. The average improvement of the results in the final evaluation was in plate tapping (EFTA) for 0.3 s and in a 30 meter running (EFSB) for 0.1 s. In the activity "sit-ups for 30 s" (EFLS), the improvement was 0.16 repetitions, while in standing broad jump (EFSK) this improvement was 0.66 cm. The highest deviation from the mean value, which is indicated by standard deviation, in the initial evaluation was for the activity "bent arm hang" (EFZG) with a value of 219.73. In the final evaluation, the highest deviation was in 10x5 meter shuttle run (EFAG) and for the activity "sit-ups" for 30 s (EFLS) higher than 3.00, which indicates the model of a leptokurtic curve proving that the results are very heterogeneous.

The values of the Kolmogorov-Smirnov test indicate that the distribution of values for the results of the researched variables in the initial and final evaluation is within a normal distribution (*Table2, Table 4*).

b) Significance of difference between the experimental and control group of pupils in the initial and final evaluation in relation to the state of motor abilities

The value of multivariate analysis of variance (*Table 5*) proves that there is no statistically significant difference between the experimental and control group of pupils in the initial evaluation, in relation to the six researched motor variables as the level of statistical significance is p=.153. This is also proved by the value of discriminant analysis which denotes that there is no statistically significant difference nor clearly defined borders between the experimental and control group of pupils in the initial evaluation in relation to the six researched variables. The level of statistical significance is p=.163.

Table 5. *Significance of difference between the experimental and control group of pupils on the initial and final evaluation in relation to the state of motor abilities*

Analysis	N	F-i	p-i	F-f	p-f
Manova	6	1.652	.153	6.591	.000
Discriminant	6	1.618	.163	6.457	.000

Legend: n - number of variables; F-i - value of F test in the initial evaluation; p-i - the level of statistical significance in the initial evaluation, F-f - the value of F test in the final evaluation; p-f - the level of statistical significance in the final evaluation.

As for the final evaluation it can be stated that there is a statistically significant difference between the experimental and control group in relation to all of the six researched variables, with the level of statistical significance p=.000. A discriminant analysis, as one of the most precise statistical procedures, indicates the existence of statistically significant difference and clearly defined borders between the experimental and control group of examinees, in relation to the researched variables.

Table 6. *The significance of differences between the experimental and control group on the initial and final evaluation in relation to the state of motor abilities by variables and discriminant coefficients on the final evaluation*

Variables	F-i	p-i	F-f	p-f	Kd-f
Plate tapping (EFTA)	.070	.793	15.580	.000	.434
10x5 meter shuttle run (EFAG)	.209	.650	1.223	.274	.000
A 30 meter running (EFSB)	.078	.781	1.551	.218	.101
Sit-ups for 30 s (EFLS)	.106	.746	11.983	.001	.286
Bent arm hang (EFZG)	4.755	.034	.008	.931	.000
Standing broad jump (EFSK)	.927	.340	.785	.379	.026

Legend: F-i - the value of F test in the initial evaluation; p-i - the level of statistical significance; F-f - the value of F test in the final evaluation; p-f - the level of statistical significance in the final evaluation; Kd - discriminant coefficients in the final evaluation.

By applying the univariate analysis between the experimental and control group of pupils in the initial evaluation a statistically significant difference was only determined for the variable "bent arm hang" (EFZG), with the level of statistical significance p=.034. The statistically significant difference is in favour of the control group.

A statistically significant difference between the experimental and control group of pupils in the final evaluation of all six variables was for plate tapping (EFTA) with the level of statistical significance p.000 and for the variable "sit-ups" for 30s (EFLS) with the level of statistical significance p=.001.

The highest difference in motor characteristics between the experimental and control group of pupils on the final evaluation was determined for the following variables: plate tapping (EFTA), with discriminant coefficient of .434 and "sit-ups for 30s" (EFLS), with discriminant coefficient .286 (*Table 6*).

c) The effects of the treatment

The application of the univariate analysis of covariance had as its aim to determine which variables had statistically significant changes because of the treatments utilized. By analyzing the data a statistically significant difference was observed between the experimental and control treatment in plate tapping (EFTA) with the level of statistical significance p=.000, sit-ups for 30s (EFLS) with the level of statistical significance p=.000, bent arm hang (EFZG) with the level of statistical significance p=.000, and standing broad jump (EFSK), with the level of statistical significance p=.000 (*Table 7*).

Table 7. *The significance of differences between the treatment of the experimental and control group in relation to the state of motor abilities in the final evaluation of variables and discriminant coefficients*

Ancova	F	P	Kd
Plate tapping EFTA (EFTA)	31.450	.000	.924
10x5 meter shuttle run EFAG (EFAG)	1.087	.302	.000
A 30 meter running EFSB (EFSB)	1.556	.218	3.214
Sit-ups for 30 s EFLS (EFLS)	43.635	.000	2.470
Bent arm hang EFZG (EFZG)	32.353	.000	2.748
Standing broad jump EFSK (EFSK)	25.944	.000	.155

Legend: F - value of F test; p - level of statistical significance, Kd - discriminant coefficients

Statistically significant differences go in favour of the effects of the experimental treatment which had in the preparatory part of physical education lessons in the experimental group the so called "obligatory part" the application of which improved the motor abilities of fourth grade primary school pupils.

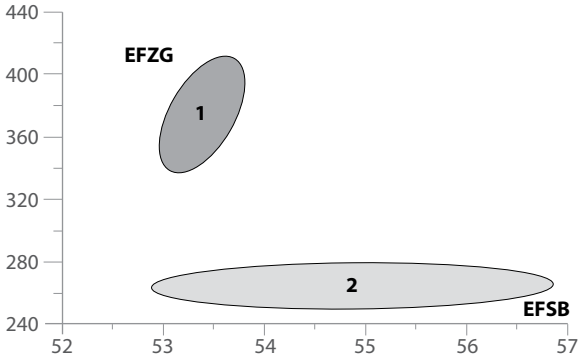
Discriminant coefficients indicate that the biggest contribution to discrimination between different treatments, in relation to the researched variables (i.e. that the difference is the highest) is in the 30 metre run (EFSB), with the discriminant coefficient of 3.214 and bent arm hang (EFZG) with the discriminant coefficient 2.748.

Table 8. *Significance of differences between the treatment of pupils in the experimental and control group on the basis of trust interval of corrected arithmetic mean in relation to the state of motor abilities on the final evaluation*

Groups		Variables	Corrected means		Trust intervals	
Experimental	Control	EFTA (EFTA)	116.27	125.87	-12.83	-6.36
Experimental	Control	EFAG (EFAG)	205.15	322.10	-340.29	106.38
Experimental	Control	EFSB (EFSB)	53.38	54.80	-3.66	.81
Experimental	Control	EFLS (EFLS)	25.33	22.75	1.88	3.29
Experimental	Control	EFZG (EFZG)	374.54	264.67	69.56	150.18
Experimental	Control	EFSK (EFSK)	150.00	142.33	4.79	10.56

Since trust intervals for four out of six variables do not have zero, it can be stated that there is a difference between the experimental and control treatment for plate tapping (EFTA), sit-ups for 30s (EFLS), bent arm hang (EFZG) and standing broad jump (EFSK). The difference is in favour of the experimental treatment (*Table 8*).

In order to understand *Graph 1* it should be pointed out that the horizontal axis represents the 30 metre running (EFSB), and the ordinate (vertical axis) represents variable bent arm hang (EFZG).



Graph 1. *Ellipsis of trust interval of the experimental and control group of pupils in relation to two most discriminative states - a 30 metre running (EFSB) and bent arm hang (EFZG)*

Legend: experimental group (1) and control group (2); bent arm hang (EFZG) and a 30 meter run (EFSB).

It is possible to notice that the results of the experimental group in the final evaluation for both variables are better in relation to those of the control group of pupils.

Conclusion

Based on the results of this research it can be stated that the experimental treatment which was carried out with pupils in the experimental group caused more qualitative transformations of motor abilities in relation to the regular programme of physical education lessons which was being carried out in the control group. The experimental lesson structure which had a prolonged preparatory part (in this work presented as "obligatory part" of a lesson) was confirmed. The focus was on the development of motor abilities in six variables. The results of this research confirmed significant

progress in the abilities of pupils who were in the experimental group in relation to the pupils who were in the control group, for all six researched variables.

Many authors in their researches of theoretical character did not try to prove by experiment the justification of the changed structures of physical education lessons (Arunović 1982; Tripković 1983 and Milanović 1986).

Statistically significant improvement of the results was determined in the experimental group in the final evaluation for two out of the six researched variables in comparison to the initial evaluation. The treatment effects show statistically significant improvement of the results for four out of the six variables in the experimental group. Through the analysis of covariance, once again the results of the experimental treatment, which consisted of a prolonged time in the preparatory part of the physical education lesson, were confirmed. Statistically significant improvements of the results were not evident in the 30 metre run and 10x5 metre shuttle run. There were no improvements in speed in the experiments done by Panić (1999) and Marković and Višnjić (2008). This was expected because the speed, as a motor skill, is significantly genetically predetermined. Moreover, the time of experimental treatment was too short to provoke statistically significant transformations in pupils' speed for both groups. The contents planned and carried out in the experimental group by their nature could not make more significant transformations of pupils' speed.

This research confirmed that a modified structure in the organization of physical exercise in educational activities is not only possible but also desired, when the goal is stimulating the development of children's motor abilities. For younger school children, at the time of their transfer from pre-school to school, it means appropriate physical activities for their age and individual characteristics as well as meeting children's needs to learn by playing and thus developing their potentials.

It is believed that the results of this research will be motivating for researchers in the area of motor abilities of younger school children. A significant segment of further research could be the organisation of physical activities of school children as a factor of their motor development in lower primary school grades.

Note. *This work has been carried out as part of a project "Effects of applied physical activity on locomotor, metabolic, psycho-social and educational status of the population in the Republic of Serbia" under the number III47015, and as a part of sub project "Effects of applied physical activity on locomotor, psycho-social and educational status of school population in the Republic of Serbia" which is funded by the Ministry of Education and Science, Republic of Serbia – Cycle of scientific projects 2011-2014. This article is also the result of the projects "From encouraging initiative, cooperation and creativity in education to new roles and identities in society" (No. 179034) and "Improving the quality and accessibility of education in the modernization processes in Serbia" (No 47008), financially supported by the Ministry of Education and Science, Republic of Serbia (2011-2014).*

References

Ackermann, E. (2004). *The Whole Child Development Guide*. Retrieved March 9th, 2012 from the World Wide Web http://cache.lego.com/upload/contentTemplating.

Arunović, D. (1982). Neke ideje za prestruktuiranje časa telesnog vežbanja sa učenicima starijeg školskog uzrasta. *Fizička kultura*, (3), 256-257.

Fine Motor Development and early school performance. Retrieved March 12th, 2012 from the World Wide Web http://www.fingergym.info/downloads/Finemotordevpp1-4.pdf.

Findak, V. (1999). *Metodika tjelesne i zdravstvene kulture.* /Teaching methods in physical education. In Croatian./ Zagreb: Školska knjiga.

Ilić, S. & Mijatović, S. (2006). *Istorija fizičke kulture*. Beograd: DTA TRADE.

Kamenov, E. (1999). *Predškolska pedagogija, knjiga prva*. Beograd: Zavod za udžbenike i nastavna sredstva.

Kopas-Vukašinović, E. (2010). *Predškolski programi u Srbiji*. Jagodina: Pedagoški fakultet.

Krsmanović, B. & Berković, L. (1999). *Teorija i metodika fizičkog vaspitanja*. Novi Sad: Fakultet fizičke kulture.

Kukolj, M., Arunović, D., Stepić, Ž. & Zdravković, S. (1993). Poređenje dve baterije testova (JZFKMS i EUROFIT) za procenu fizičkih sposobnosti učenika. *Fizička kultura*, (4), 196-200.

Marković, Ž. & Višnjić, D. (2008). *Modifikacija strukture časa fizičkog vaspitanja kao mogućnost efikasnijeg razvoja fizičkih sposobnosti učenica*. U G. Bala (ur.), Zbornik radova sa interdisciplinarne naučne konferencije sa međunarodnim učešćem, „Antropološki status i fizička aktivnost dece, omladine i odraslih" (339-346). Novi Sad: Fakultet sporta i fizičkog vaspitanja.

Matić, M. (1978). *Čas telesnog vežbanja*. Beograd: NIP Partizan.

Mejovšek, M. (1962). *Opća metodika nastave fizičkog odgoja*. Zagreb: Visoka škola za fizičku kulturu.

Milanović, LJ. (1986). Prilog ideji o prestruktuiranju časa fizičkog vaspitanja. *Fizička kultura*, (3), 199-200.

Ministarstvo prosvete i sporta Republike Srbije/Ministry of Education and Sport of the Republic of Serbia/ (2006). *Pravilnik o Opštim osnovama predškolskog programa*. Beograd: Prosvetni pregled.

Panić, B. (1999). Program razvoja snage i sile u modifikovanoj strukturi časa i njegov uticaj na neke fizičke sposobnosti učenika prvog razreda osnovne škole. *Fizička kultura*, 53(1-4), 7-16.

Rodić, N. (2000). *Teorija i metodika fizičkog vaspitanja*. Sombor: Učiteljski fakultet u Somboru.

Tripković, M. 1983: Povodom članka Arunovića, D. (1982). Neke ideje za prestruktuiranje časa telesnog vežbanja sa učenicima starijeg školskog uzrasta. *Fizička kultura*, (1), 65-66.

Višnjić, D., Miletić, K. & Jovanović, A. (2004). *Teorija i metodika fizičkog vaspitanja*. Beograd: Autorsko izdanje.

Živorad Marković
Faculty of Education in Jagodina, University of Kragujevac
14 Milana Mijalkovića, 35000 Jagodina, Serbia
zimarkovic@yahoo.com

Emina Kopas-Vukašinović
Faculty of Education in Jagodina, University of Kragujevac
14 Milana Mijalkovića, 35000 Jagodina, Serbia
ekopas@rcub.bg.ac.rs

Organizacija tjelovježbe kao preduvjet kvalitetnog razvoja motoričkih sposobnosti kod školske djece

Sažetak

U ovom radu autori razmatraju značenje organiziranja tjelovježbe u svrhu razvoja sposobnosti školske djece. Vodeći se teorijskim temeljima da fizički razvoj djeteta predstavlja temelj njegova cjelokupnog razvoja, te da su fine motoričke vještine određene razvojem grube motorike, autori ističu značenje sadržaja i strukture programa tjelovježbe u nižim razredima osnovne škole. Učinci kultiviranja dječjeg razvoja u predškolskom periodu vidljivi su kod djece u nižim razredima osnovne škole. Cilj je ovog istraživanja bio utvrditi određuje li, i u kojoj mjeri, različita organizacija pripremnoga dijela nastave tjelovježbe, razlike u razvoju motoričkih sposobnosti djece mlađega osnovnoškolskog uzrasta. Uporabom eksperimentalne metode, ispitivani su učinci produženoga pripremnog dijela nastavnog sata. Taj je dio ostvaren kroz sustav vježbi za koje se pretpostavlja da imaju utjecaja na transformaciju motoričkih sposobnosti u odnosu na strukturu sata s uobičajenim trajanjem određenih dijelova. Utvrđeno je da određeno povećanje kretanja tijekom tjelovježbe može značajno pridonijeti boljem razvoju motoričkih sposobnosti. Te sposobnosti utječu na pravilan tjelesni razvoj i bolje zdravlje, što je i opći cilj nastave tjelesne i zdravstvene kulture.

Ključne riječi: *struktura sata; pripremni dio sata tjelesne i zdravstvene kulture; program tjelesne i zdravstvene kulture*

Uvod

U sustavu ujednačene prakse u predškolskim i školskim institucijama, motoričke sposobnosti djece (učenika) određuju njihov razvoj u svakom pogledu. Zbog navedenog, bitno je odgovarajuće planirati i organizirati svakodnevnu tjelovježbu, u skladu s dobi djeteta, psihofizičkim karakteristikama njihova razvoja i individualnim sposobnostima. U situaciji kad je poznato da djeca u ranoj dobi jako brzo razvijaju

motoričke sposobnosti, te da je taj razvoj genetski predodređen, redovita i pravilno primijenjena djetetova fizička aktivnost pridonosi složenijim motoričkim sposobnostima. Jedna od najvažnijih funkcija predškolskog obrazovanja i odgoja pripremanje je djece za školu, što uključuje i pripremu motoričkih sposobnosti (razvoj grubih motoričkih sposobnosti, fine motorike i grafomotorike). Na razvoj motoričkih sposobnosti kod mlađe školske djece može se utjecati pravilnom strukturom nastavnog sata tjelesne i zdravstvene kulture. Važno je uzeti u obzir različite mogućnosti strukturiranja tih nastavnih sati. Jedna je od mogućnosti organizacija produženog opće-pripremnog dijela nastavnog sata tjelesne i zdravstvene kulture uvođenjem dodatnog skupa vježbi koje bi mogle utjecati na transformaciju učeničkih motoričkih sposobnosti. Učinke tako strukturirane nastave tjelesne i zdravstvene kulture moguće je mjeriti praćenjem rezultata učenika u kvaliteti motoričkih sposobnosti.

Značenje tjelesne i zdravstvene kulture za predškolsku i školsku djecu

Jedinstveni cilj tjelesne i zdravstvene kulture u predškolskim i školskim programima, jačanje je zdravlja, pravilan tjelesni razvoj i izgradnja temelja za zdravu tjelesnu konstituciju. Čak i u prvim predškolskim programima u Srbiji, krajem 19. stoljeća, obrazovanje predškolske djece imalo je za cilj razvoj dječjeg tijela, osjeta i duha da bi se djeca zaštitila od loših utjecaja i nezgoda, jačanje dječjeg organizma i poboljšanje tjelesnog razvoja (Kopas-Vukašinović, 2010). To je značilo utvrđivanje temelja za zdravu tjelesnu konstituciju i postupnu složenost tjelesnih aktivnosti predškolske i školske djece. Tada je u kurikulu nacionalnih škola postojao zahtjev za ostvarivanjem sadržaja iz gimnastike, plivanja, ekskurzija i dječjih igara s ciljem zaštite i jačanja zdravlja.

Tako su tjelovježbom u predškolskim institucijama i školi ostvarivane zadaće tjelesne i zdravstvene kulture, s ciljem razvoja zdrava, tjelesno dobro i pravilno razvijena djeteta koje će postupno ovladati svojom motorikom, razviti osjetila i fizičke sposobnosti poput sigurnosti, spretnosti i usklađenosti motorike i, u konačnici, stvoriti naviku svakodnevne tjelovježbe. Kad su u pitanju tjelesne sposobnosti školskog djeteta, potrebno je naglasiti da su one u značajnoj mjeri genetski uvjetovane i pod utjecajem zakonitosti tjelesnog razvoja (Panić, 1999).

Razvoj motorike predškolskog djeteta određen je cefalo-kaudalnim i proksimo-distalnim smjerovima razvoja. To implicira da odgovarajući razvoj "grube motorike" kod predškolskog djeteta pridonosi kvalitativnom razvoju fine motorike koja kasnije omogućava precizne i fine pokrete (Ackermann, 2004). Zbog toga "vježbe istezanja" u predškolskoj dobi zauzimaju posebno mjesto u metodici pri realizaciji nastave tjelovježbe jer iniciraju "razvoj trupa, ramena, kukova i mišića" (ibid.).

Fizički razvoj djeteta predstavlja temelj za razvoj njegovih ukupnih potencijala. Stoga nije slučajnost da se među zadatke tjelesne i zdravstvene kulture u predškolskim i školskim programima, postavlja i razvoj pozitivnih osobina ličnosti, kao i jačanje samopouzdanja, razvoj kognitivnih sposobnosti, njegovanje pozitivnih emocija i

jačanje prosocijalnog ponašanja. Navedeni zadaci su čak i danas aktivni u prethodno spomenutim programima.

Konkretizacija tako postavljenih zadaća tjelesne i zdravstvene kulture kod djece predškolskog i školskog uzrasta, nameće složenu organizaciju fizičkih aktivnosti s djecom (vođene aktivnosti u predškolskim ustanovama i programske aktivnosti u školi). Sa sigurnošću možemo tvrditi da odgovarajuće organizirana tjelovježba znači pripremu djece za složenije tjelesne aktivnosti u školskoj dobi, što pak pridonosi jačanju njihovih motoričkih sposobnosti. Tjelesna i zdravstvena kultura predmet je istraživanja mnogih stranih i domaćih teoretičara i istraživača. Istražuje se rad s djecom kako kroz različite tjelesne, osjetilne te zdravstvene i higijenske aktivnosti koje potiču razvoj motorike od temeljnih sposobnosti kretanja, vježbe i usvajanja osnovnih pokreta kod djece do općih i specifičnih sposobnosti kretanja (Kamenov, 1999; Ministarstvo prosvete i sporta Republike Srbije, 2006). Strukturiranje aktivnosti tjelovježbe u predškolskim ustanovama znači njihovu usklađenost s dobi i individualnim sposobnostima djece, kao i s potrebom djece za kretanjem u cilju stjecanja motoričkih sposobnosti. Kad govorimo o organizaciji aktivnosti tjelovježbe kod školske djece, one su organizirane u sustavu nastavnih sati, krećući od optimalne razine tjelesnog razvoja učenika. Ciljevi i zadaci učenika određeni su s obzirom na napredak već razvijenih općih sposobnosti kretanja (brzina, snaga , izdržljivost...), a zatim na razvoj specifičnih sposobnosti kretanja, sukladno mogućnostima svakog pojedinog učenika. Sadržaj programa tjelesne i zdravstvene kulture predstavljen je trima tematskim područjima: razvojem fizičkih sposobnosti, tehničkim sportskim obrazovanjem i vezom tjelesne i zdravstvene kulture sa životom i poslom.

Sa sigurnošću možemo tvrditi da odgovarajuća organizacija obrazovne aktivnosti u školi podrazumijeva točnu vremensku artikulaciju planiranih aktivnosti. Mercurialis je u XVI. st. istraživao strukturu nastavnog sata tjelesne i zdravstvene kulture. U knjizi *Gimnastičke vještine* podijelio je strukturu nastave gimnastike na tri dijela: pripremni, osnovni i završni dio. Od tada su različiti autori različito odredili strukturu sata tjelesne i zdravstvene kulture (vježbanja). Prema Lingu, nastavni se sat vježbanja sastoji od pet dijelova, a to su: uobičajeno vježbanje, pripremne kretnje, osnovne (glavne) vježbe, primijenjene vježbe i vježbe za smirenje. Vrijeme trajanja svakog dijela nastavnog sata određeno je učeničkom dobi (Ilić i Mijatović, 2006). Početkom XX. st., s ciljem prilagođavanja sheme nastave tjelesne i zdravstvene kulture zahtjevima suvremenih obrazovnih koncepata, Linhart predlaže skraćivanje vremena učeničkog vježbanja (Milanović, 1986). Danas, prominentni metodičari tjelesne i zdravstvene kulture ističu mogućnost fleksibilnog određivanja trajanja dijelova nastavnog sata, a prema posebnostima u strukturiranju nastavnih sati (Arunović, 1982; Milanović, 1986; Findak, 1999; Marković i Višnjić, 2008; Matić, 1978; Mejovšek, 1962; Rodić, 2000; Tripković, 1983; Višnjić, Miletić i Jovanović, 2004). Jasno je da strukturu sata ne treba shvaćati kao shemu, gotov recept kojeg treba primjenjivati uvijek i u svakoj situaciji (Krsmanović i Berković, 1999).

Različita struktura sata utječe na dječje rezultate u fizičkim aktivnostima. Zbog toga polazimo od tvrdnje da organizacija tjelovježbe može biti značajna početna točka kvalitativnog razvoja motoričkih sposobnosti djece u predškolskim institucijama i školama.

Metodologija istraživanja

Cilj istraživanja

Cilj je ovog istraživanja utvrditi određuje li, i u kojoj mjeri, različita organizacija pripremnog dijela sata tjelesne i zdravstvene kulture razlike u razvoju motoričkih sposobnosti kod mlađeg školskog uzrasta. Taj primarni cilj istraživanja podijeljen je u sljedeće ciljeve: a) vrednovati *učinke produženog pripremnog dijela sata tjelesne i zdravstvene kulture,* što je ostvareno skupom vježbi, koje bi mogle utjecati na transformaciju učeničkih motoričkih sposobnosti; b) vrednovati *učinak primjene dodatnih vježbi* u produženom pripremnom dijelu sata, u odnosu na razvoj učeničkih temeljnih fizičkih karakteristika i većih mišićnih zona.

Zadaci istraživanja

1. Vrednovati razinu motoričkih sposobnosti učenika ispitnoj i kontrolnoj skupini (inicijalno i finalno vrednovanje).
2. Utvrditi značajnost razlike između ispitne i kontrolne skupine učenika na inicijalnom i finalnom vrednovanju u odnosu na motoričke sposobnosti.
3. Utvrditi značajnost razlike učinaka ispitnog i kontrolnog postupka u odnosu na stanje motoričkih sposobnosti.

Metodologija, vrijeme i mjesto istraživanja

Provedeno je longitudinalno istraživanje eksperimentalnog karaktera. Primijenjen je pedagoški eksperiment s paralelnim skupinama.

Istraživanje je provedeno u osnovnoj školi "Jovan Jovanović Zmaj" u Svilajncu, Republika Srbija tijekom prvog polugodišta školske godine 2010./2011. Eksperiment je proveden s učenicima četvrtog razreda osnove škole i trajao je 35 nastavnih jedinica. Svaka nastavna jedinica je trajala 45 minuta. Vrijeme vježbanja bilo je jednako u kontrolnoj i ispitnoj skupini.

Tijek istraživanja

Inicijalna provjera provedena je tijekom prva dva sata redovne nastave tjelesne i zdravstvene kulture. Nakon inicijalne provjere započelo je provođenje postupka kroz 30 školskih sati. Eksperiment se sastojao od produženoga uvodnog dijela sata tjelesne i zdravstvene kulture, koji je nazvan "obvezni dio" i bio je usmjeren k poboljšanju motoričkih sposobnosti učenika. Osim obveznog skupa vježbi oblikovanja u trajanju od pet minuta, pripremni je dio imao još deset dodatnih minuta organiziranih aktivnosti namijenjenih razvoju učeničkih motoričkih sposobnosti. Skup vježbi

oblikovanja mijenjan je nakon svakih deset sati. U prvom skupu vježbi učenici su vježbe izvodili individualno. Drugi skup vježbi sastojao se od vježbi u paru, a treći se skup sastojao od vježbi oblikovanja s rekvizitima (lopte, štapovi...). Nakon skupa koji se sastojao od 8 do 10 vježbi oblikovanja ostvaren je "obvezni dio" pripremnog dijela sata.

Program dodatnih vježbi sastojao se od organiziranih vježbi snage. Taj je program izvođen prema topološkom kriteriju, tj. tijekom jednog tjedna rađene su vježbe ruku, ramena i trupa u jednom satu, na drugom satu radile su se vježbe trupa i nogu, a na trećem satu rađene su vježbe za ruke, ramena i noge. S takvom dinamikom vježbanja sve su velike mišićne skupine podvrgnute intenzivnom opterećenju dvaput tjedno. Osim topološkog kriterija, vježbe u "obvezatnom dijelu" pripremnog dijela nastavnog sata bile su organizirane u svrhu jačanja onih mišićnih skupina koje su bile manje aktivne tijekom glavnog dijela sata. Te su vježbe organizirane kao dodatne vježbe vezane uz primarne vježbe tijekom glavnog dijela sata.

Tijekom intenzivnog rada (vježbanja) učenici su dobivali upute o ispravnom početnom položaju, opsegu pokreta, broju ponavljanja u seriji, broju serija, vrsti i dužini odmora između serija i ispravnom disanju tijekom vježbanja. Na taj su način učenici usvojili i određeni korpus teorijskog znanja koje će biti korišteno za individualno vježbanje tijekom izvannastavnih aktivnosti. Dob učenika uvjetovala je planiranje sadržaja tako da je opterećenje u vježbi predstavljeno gravitacijom, vlastitim tijelom, otporom partnera sličnih sposobnosti i odgovarajućom opremom za tu dobnu skupinu.

Kontrolna skupina učenika radila (vježbala) je u skladu s klasičnom strukturom sata tjelesne i zdravstvene kulture. U kontrolnoj je skupini uvodni dio sata trajao sedam do deset minuta i sastojao se od skupine od osam do deset vježbi oblikovanja bez "obvezatnog dijela".

Za evaluaciju motoričkih sposobnosti primijenjen je skup testova "Eurofit" – šest standardnih motoričkih testova (Kukolj i sur., 1993). Svi su testovi provedeni u standardnim uvjetima u dvorani za tjelesnu i zdravstvenu kulturu.

Redoslijed provjere motoričkih sposobnosti tijekom testiranja bio je: test tapinga rukom (EFTA) – za evaluaciju segmentirane brzine ruke; 10 x 5 metara štafeta (EFAG) – za evaluaciju brzine, okretnosti; trčanje na 30 metara (EFSB) – za evaluaciju brzine sprinta; podizanje trupa u trajanju od 30 sekundi (EFLS) – za evaluaciju repetitivne snage trbušnih mišića i fleksora u području kukova; izdržaj u visu (EFZG) – za evaluaciju izometrijske snage gornjeg dijela trupa i fleksora u spojevima laktova; skok s mjesta (EFSK) – za evaluaciju eksplozivne snage nožnih ekstenzor mišića.

Statistička obrada podataka

Podaci prikupljeni empirijskim istraživanjem obrađeni su sljedećim postupcima: deskriptivnom statistikom za svaku varijablu izračunata je aritmetička sredina (M), standardna devijacija (Sd), minimalna vrijednost (Min), maksimalna vrijednost (Max), koeficijent varijacije (Cv); interval pouzdanosti (Interv. pov.), stupanj krivulje

inklinacije – asimetrije (Skew), stupanj zakrivljenosti vrha krivulje – kurtoza (Kur) i Kolmogorov-Smirnov test (KS).

Da bismo testirali značajnost razlike aritmetičkih sredina, za svaku je skupinu provedena multivarijantna analiza varijance (Manova) i diskriminantna analiza. Za značajnost razlika varijabli provedena je univarijantna analiza varijance (Anova).

U svrhu testiranja značajnosti razlika učinka eksperimenta primijenjena je univarijantna analiza kovarijance (Ancova).

Uzorak

U istraživanju je sudjelovalo 56 učenika četvrtog razreda. Bili su podijeljeni u ispitnu (26 učenika) i kontrolnu skupinu (30 učenika). Svi su učenici bili zdravi i sposobni za sudjelovanje u nastavi tjelesne i zdravstvene kulture. Tijekom istraživanja nitko nije izostao s više od 10% ukupno predviđenih sati tjelesne i zdravstvene kulture. Također, tijekom istraživanja nitko nije sudjelovao ni u kakvom drugom obliku tjelovježbe. Sa svim učenicima koji su sudjelovali u istraživanju provedena je potpuna inicijalna i finalna evaluacija motoričkih sposobnosti.

Rezultati i interpretacije

U skladu s planiranim ciljem i metodološkim pristupom, istraživali smo motoričke sposobnosti ispitne i kontrolne skupine u inicijalnom i finalnom testiranju, kao i ispitnog i kontrolnog programa.

a) Motoričke sposobnosti ispitne i kontrolne skupine učenika (inicijalna i finalna evaluacija)

Tablica 1.

Uvidom u *Tablicu 1* možemo primijetiti da se rezultati inicijalne evaluacije motoričkih sposobnosti ispitne skupine ne razlikuju značajno od optimalnih pokazatelja za tu dobnu skupinu.

Tablica 2.

Uvidom u podatke u *Tablici 2* možemo primijetiti da se rezultati inicijalne evaluacije motoričkih sposobnosti kontrolne skupine također ne razlikuju značajno od optimalnih pokazatelja za tu dobnu skupinu. Daljnjom analizom rezultata inicijalne evaluacije motoričkih sposobnosti učenika ispitne i kontrolne skupine možemo uočiti razlike među aritmetičkim sredinama. Ispitna skupina na inicijalnoj evaluaciji ima u prosjeku bolje rezultate u tapingu rukom (EFTA) za 0,92 s (sekunde), u trčanju na 30 metara (EFSB) za 0,35 s, u podizanju trupa u trajanju od 30 s, (EFLS) za 0,25 ponavljanja; kontrolna skupina je u inicijalnoj evaluaciji u prosjeku imala bolje rezultate u 10x5 metara štafeta (EFAG), za 4,83 s, izdržaj u visu (EFZG) za 114,68 s, u skoku u dalj s mjesta (EFSK) za 4,39 cm.

Tablica 3.

U ispitnoj je skupini utvrđen pozitivan učinak eksperimentalnog postupka koji je rezultirao poboljšanjem prosječnog rezultata svih šest varijabli. Poboljšanja rezultata utvrđena su za taping rukom (EFTA) za 1,17 s, u 10x5 metara štafeta (EFAG) za 2,47 s, u trčanju na 30 metara (EFSB) rezultat je bio bolji za 0,24 s, u podizanju trupa u trajanju od 30 sekundi (EFZG) rezultat je bio bolji za 2,81 ponavljanje, za izdržaj u visu (EFZG) poboljšanje je iznosilo 11,36. s, u skoku u dalj s mjesta rezultat je bio bolji za 8,84 cm. Najveće odstupanje od srednje vrijednosti zabilježeno je za aktivnost izdržaja u visu s vrijednostima od 164,98 na inicijalnoj evaluaciji i 318,23 na finalnoj evaluaciji.

Bitno je napomenuti da asimetrijska vrijednost s negativnom oznakom ukazuje na vrlo pozitivnu asimetričnu krivulju. Vrijednost koeficijenta zakrivljenosti manja je od 3,00 što određuje model leptokurtične krivulje, što znači da su rezultati homogeni.

Rezultati Kolmogorov-Smirnova testa prikazuju da je distribucija vrijednosti rezultata istraživanih varijabli na inicijalnoj i finalnoj evaluaciji u okviru normalne distribucije (*Tablica 1, Tablica 3*).

Tablica 4.

U kontrolnoj skupini učenika koji su radili po klasičnoj strukturi sata nastave tjelesne i zdravstvene kulture pozitivne učinke poboljšanja prosječnog rezultata zabilježili smo na četiri od šest promatranih varijabli. Prosječno poboljšanje rezultata na finalnoj evaluaciji uočili smo kod testa tapinga rukom (EFTA) za 0,3 s i na trčanju na 30 metara (EFSB) za 0,1 s. U aktivnosti podizanja trupa u 30 sekundi (EFLS) poboljšanje je iznosilo 0,16 ponavljanja, dok je u skoku u dalj s mjesta (EFSK) to poboljšanje iznosilo 0,66 cm. Najveći otklon od srednje vrijednosti, koji je indiciran standardnom devijacijom, bio je na inicijalnoj evaluaciji za izdržaj u visu (EFZG) s vrijednošću od 219,73. Na finalnoj evaluaciji, najveće odstupanje je bilo na 10x5 trčanju štafete (EFAG) i za aktivnost podizanja trupa (EFLS) više od 3,00. što ukazuje na model leptokurtične krivulje, što dokazuje da su rezultati vrlo heterogeni.

Vrijednosti Kolmogorov-Smirnova testa upućuju na to da je distribucija vrijednosti za rezultate istraživanih varijabli, na inicijalnoj i finalnoj evaluaciji, unutar normalne distribucije. (*Tablica 2, Tablica 4*).

b) Značajnost razlike između ispitne i kontrolne skupine učenika na inicijalnoj i finalnoj evaluaciji s obzirom na stanje motoričkih sposobnosti.

Vrijednost multivarijantne analize varijance (*Tablica 5*) dokazuje da između ispitne i kontrolne skupine učenika na inicijalnoj evaluaciji s obzirom na šest promatranih motoričkih varijabli, ne postoji statistički značajna razlika, s obzirom da je razina statističke značajnosti p=,153. To je također dokazano i vrijednošću diskriminativne analize koja pokazuje da ne postoji statistički značajna razlika i jasno razgraničenje između ispitne i kontrolne skupine učenika na inicijalnoj evaluaciji s obzirom na šest promatranih varijabli. Razina statističke značajnosti je p=,163.

Tablica 5.

Na finalnoj evaluaciji može se ustvrditi postojanje statistički značajne razlike između ispitne i kontrolne skupine s obzirom na svih šest promatranih varijabli, s razinom statističke značajnosti p=,000. Diskriminativna analiza, kao jedan od najpreciznijih statističkih postupaka, ukazuje na postojanje statistički značajnih razlika i jasno razgraničuje ispitnu od kontrolne skupine s obzirom na promatrane varijable.

Tablica 6.

Primjenom univarijante analize između ispitne i kontrolne skupine učenika na inicijalnoj evaluaciji utvrđeno je postojanje statistički značajne razlike samo za varijablu izdržaja u visu (EFZG), s razinom statičke značajnosti p=,034. Značajnost je u korist kontrolne skupine.

Statistički značajne razlike između ispitne i kontrolne skupine učenika na finalnoj evaluaciji svih šest varijabli pronađene su kod tapinga rukom (EFTA) s razinom statističke značajnosti p=,000 i u varijabli podizanje trupa u trajanju od 30 sekundi (EFLS) s razinom statističke značajnosti p=,001.

Najveća razlika u motoričkim osobinama između ispitne i kontrolne skupine učenika na finalnoj evaluaciji utvrđena je u sljedećim varijablama: taping rukom (EFTA) s koeficijentom diskriminacije od ,434 i podizanje trupa u trajanju od 30 sekundi (EFTA) s koeficijentom diskriminacije ,286 (*Tablica 6*).

c) Učinci postupka

Primjena univarijantne analize kovarijance za cilj je imala utvrđivanje varijabli koje imaju statistički značajne promjene zbog provedenog postupka. Analizom podataka statistički značajna razlika može se vidjeti između ispitnog i kontrolnog postupka kod tapinga rukom (EFTA) s razinom statističke značajnosti p=,000, podizanja trupa u trajanju od 30 sekundi (EFLS) s razinom statističke značajnosti p=,000, izdržaja u visu (EFZG) s razinom statističke značajnosti p=,'000 i skoka u dalj s mjesta (EFSK) s razinom statističke značajnosti od p=,000 (*Tablica 7*).

Tablica 7.

Statistički značajne razlike idu u prilog učincima eksperimentalnih postupaka koji su se u ispitnoj skupini realizirali u pripremnom dijelu sata tjelesne kulture, nazvanog „obvezni dio" čije je izvođenje poboljšalo motoričke vještine učenika u četvrtim razredima osnovne škole.

Koeficijent diskriminacije ukazuje na to da je najveći doprinos diskriminaciji između različitih postupaka s obzirom na promatrane varijable (npr. da je razlika najveća) u trčanju na 30 metara (EFSB) s koeficijentom diskriminacije od 3,214 i izdržaju u visu (EFZG) s koeficijentom diskriminacije od 2,748.

Tablica 8.

S obzirom da intervali pouzdanosti za četiri od šest varijabli nemaju nulu, može se zaključiti da postoji razlika između eksperimentalnog i kontrolnog postupka u

tapingu rukom (EFTA), podizanju trupa u trajanju od 30 sekundi (EFLS), izdržaju u visu (EFZG) i skoku u dalj s mjesta (EFSK). Razlika je u korist eksperimentalnog postupka (*Tablica 8*).

Da bismo razumjeli *Sliku 1* potrebno je istaknuti da apscisa (vodoravna os) predstavlja trčanje na 30 metara (EFSB), a ordinata (okomita os) predstavlja varijablu izdržaja u visu (EFZG).

Slika 1.

Moguće je primijetiti da su rezultati ispitne skupine na finalnoj evaluaciji za obje varijable bolji u usporedbi s kontrolnom skupinom učenika.

Zaključak

Temeljem rezultata istraživanja možemo utvrditi da je eksperimentalni program ostvaren s učenicima ispitne skupine imao veći utjecaj na kvalitativne transformacije motoričkih sposobnosti u usporedbi s redovitim programom nastave tjelesne i zdravstvene kulture provedenim s kontrolnom skupinom. Potvrđena je eksperimentalna struktura sata s produženim pripremnim dijelom (koji je u radu predstavljen kao "obvezni dio"). Naglasak je bio na razvoju motoričkih sposobnosti u šest varijabli. Rezultati istraživanja potvrdili su značajan napredak sposobnosti učenika ispitne skupine u usporedbi s učenicima kontrolne skupine u svih šest promatranih varijabli.

Mnogi autori u svojim istraživanjima teorijskog karaktera nisu probali eksperimentalno dokazati opravdanost promijenjene strukture sata tjelesne i zdravstvene kulture (Arunović, 1982; Tripković, 1983 i Milanović, 1986).

Statistički značajno poboljšanje rezultata utvrđeno je u ispitnoj skupini na finalnoj evaluaciji za četiri od šest promatranih varijabli u usporedbi s inicijalnom evaluacijom. Učinci postupka pokazuju statistički značajna poboljšanja za četiri od šest promatranih varijabli. Analizom kovarijance, rezultati eksperimentalnog postupka, koji se sastojao od produženog pripremnog dijela sata nastave tjelesne i zdravstvene kulture, još su jednom potvrđeni. Statistički značajno poboljšanje nije ostvareno u trčanju na 30 metara i 10x5 trčanju štafete. Poboljšanja u brzini nije bilo ni u eksperimentu koji su proveli Panić (1999) i Marković i Višnjić (2008). To je bilo i očekivano s obzirom da je brzina kao motorička sposobnost u značajnoj mjeri genetski predodređena. Pored toga, vrijeme provođenja eksperimenta bilo je prekratko da bi potaklo statistički značajnije transformacije brzine kod učenika u objema skupinama. Planirani i ostvareni sadržaji u ispitnoj skupini ionako po prirodi stvari ne bi mogli utjecati na značajniju transformaciju brzine učenika.

Opisano istraživanje potvrdilo je da modificirana struktura organizirane tjelovježbe u obrazovnim aktivnostima nije samo moguća već je i poželjna, s ciljem poticanja razvoja dječjih motoričkih sposobnosti. Za djecu mlađe školske dobi, u trenutku prelaska iz predškole u školu, to znači fizičku aktivnost prilagođenu njihovoj dobi i

individualnim osobinama, kao i dječjoj potrebi za učenjem kroz igru u svrhu razvoja svojih potencijala.

Vjeruje se da će rezultati ovog istraživanja biti motivirajući za istraživače u području motoričkih sposobnosti kod djece mlađe školske dobi. Značajno područje budućih istraživanja može biti organizacija tjelovježbe školske djece kao čimbenik njihova motoričkog razvoja u nižim razredima.

Bilješka. *Ovaj je rad ostvaren kao dio projekta "Učinci primijenjene tjelovježbe na lokomotorni, metabolički, psiho-socijalni i obrazovni status populacije u Republici Srbiji" pod brojem III47015, i kao dio potprojekta "Učinci primijenjene tjelovježbe na lokomotorni, metabolički, psiho-socijalni i obrazovni status školske populacije u Republici Srbiji" kojeg je osnovalo Ministarstvo obrazovanja i znanosti, Republike Srbije – Ciklus znanstvenih projekata 2011. – 2014. Rad je također rezultat projekata "Od ohrabrujuće inicijative, kooperacije i kreativnosti u obrazovanju do novih uloga i identiteta u društvu" (br. 179034) i "Poboljšavanje kakvoće i dostupnosti obrazovanja u procesu modernizacije u Srbiji" (br 47008), koje je financijski podržalo Ministarstvo obrazovanja i znanosti Republike Srbije (2011.-2014.).*