IMPACTS OF SPECIFIC EXERCISING ON MOTOR ABILITIES DEVELOPMENT IN JUNIOR ELEMENTARY SCHOOLCHILDREN

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Abstract

On a sample of 40 subjects, schoolboys of Nis primary schools, male subjects aged 13 years (+ - 6 months), a longitudinal study was conducted to determine the effects of a specific exercising program for the development of motor skills in subjects who, in addition to regular physical education classes, were subjected to training work in the school sports section (the experimental group of 20 subjects). The control group implemented PE curricula classes according to the program of the Ministry of Education and had no additional exercises (20 subjects). Two hypotheses were set based on the assumption that the additional work will exert significantly positive impact on the transformation processes in the experimental group subjects. Measuring instruments for the motor abilities assessment were: 1. 50m high start, 2. 20m high start, 3. 20m flying start, 4. standing long jump, 5. standing triple jump, 6. ball throwing. The experiment lasted 24 school hours or 3 months. Two measurements were carried out, initial and final one, after the completion of the experiment. The results were statistically analyzed and presented in 8 tables on the basis of which the conclusions were drawn. Both hypotheses were confirmed because the experimental program significantly influenced the improvement of motor abilities of the experimental group subjects.

Key words: *specific exercising program, motor skills, school sports section, transformation processes, schoolboys*

Introduction

Training process aiming at raising general physical condition in elementary schoolchildren is a complex educational process at the basis of which is an organized physical exercising and mastering technical and tactical elements, applying certain specific exercises and load in order to activate the elementary and complex biological and psychological processes. As a result of these processes, a so called super - compensation occurs.

In this way, the improvement of the highest number of anthropological dimensions (psychological, intellectual, morphological, technical and tactical), is achieved, which is mainly manifested in the increasing levels of athletic performances. A modern way of life and numerous sporting achievements require that physical abilities raising starts from an early childhood, by applying a modern scientific methodology and organizational forms of work, of course, aligned with the intensity and volume of the load.

For these reasons, the role of sports school section is constantly gaining in relevance bearing in mind the ever increasing demands of the modern physical education teaching, especially aiming at preserving and improving the health of children. (Bala, 1981; Weineck, 2000; Visnjic et al., 2004; Pržulj, 2006; Milanovic, 2007). It was necessary for these vary reasons to determine the effects of working in a school sports section on developing elementary and complex motor skills as a primary basis for further effective sports engagement.

Subject, aims and research tasks
The subject of this research was to investigate the effects of a specific work program on the development of general motor skills in Nis elementary schools male schoolchildren attending both a regular physical education teaching and a training process in the school sports section.

In addition, the research also investigated motor skills of students who are included only in the regular physical education teaching process. The main problem of the research is to investigate the efficiency of a specific program for the development of motor skills in the context of a school sports section and the efficiency of the regular physical education teaching as compared to the initial state. The aim of the research is to determine differences in the development of motor skills in children in the control and experimental group, i.e. between the schoolchildren who have had an additional training in the framework of a special school sports sections and students who have not had it.

Hypothesis
Based on the research object, problems and research objectives there have been set up one primary and one working hypothesis: H - There is a statistically significant impact of an additional specific training on the motor skills transformational processes in the experimental group subjects. H1- There are statistically significant differences in the experimental and control groups of subjects' motor abilities in the final measuring.

Methods

Subject sample
A sample of 40 subjects was derived from the population of the 7th grade elementary schools in Nis schoolboys, chronological age of 13 years, included in the regular physical education classes, with a good health status. Basic sample was divided into two subgroups: the experimental and control group. Experimental group was made up of 20 subjects who, in addition to regular PE classes underwent a work program aiming at the motor skills development, following a special exercise program for a period of three months. The control group also had 20 participants who had only three hours of regular physical education classes per week.

Measurement instruments sample
Measuring instruments for motor abilities assessment: Sprint speed: 1. 50m high start (M50VS), 2. 20m high start (M20VS) 3. 20m flying start (M20LS); Explosive strength: 1.Standing long jump (MSKDM), 2. Standing triple jump (MTRSK) 3. Ball throwing (MBLOP). Measuring instruments were taken from the research of N.Kurelić et al. (1975).

Experimental research program
Research on the influence of a specific training on the motor skills development in children in school sports section was conducted within 24 training hours in a period of three months. For this purpose we used specially prepared program for the development of motor skills.

Table 1. Specific exercising program structure

PROGRAM UNITS	NO. OF HOURS
Initial testing of anthropological features – motor abilities	4
Speed development program	5
General endurance development program	4
Anaerobic – aerobic endurance development program	4
Stretching program	3
Final testing of anthropological features – motor abilities	4
Total	24

Plan and program for the control group was implemented on the basis of the curriculum designed and approved by the Ministry of Education of the Republic of Serbia. The experimental program lasted three months, or 24 teaching hours.

Data processing methods
The obtained results were statistically analyzed and presented through a number of tables. For this purpose, the program "Statistica" 8.0 for Windows was used. The following parameters were calculated: descriptive statistical parameters, measuring discrimination applying Skewness (SKEW) and Kurtosis (KURT), Student's T-test, multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA).

Results

Table 2. Basic statistical parameters of motor abilities of the experimental group subjects on initial measurement.

Var.	N	Mean	Min.	Max.	Std. Dev.	Skewn.	Kurtos.
M50 VS	20	8.63	8.32 '	9,42	4.69	0.435	-1.319
M20VS	20	3.58	3.29	4.25	7.47	-0.063	-0.693
M20LS	20	2.93	2.72	3.19	12.61	0.143	2.411
MSKDM	20	172.14	154.00	205.00	2.14	0.645	-0.307
MTRSK	20	528.15	482.00	594.00	1.82	0.795	2.831
MBLOP	20	330.10	260.00	419.00	4.71	1.126	0.849

Legend: Arithmetic Mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. dev.), Skewness (Skewn.), Kurtosis (Kurtos.)

Analyzing the obtained results in Table 2 it can be concluded that the results are within the normal distribution because Skewness and Kurtosis mostly indicate considerable sensitivity of different motor dimensions, which can be seen in ball throwing, long jump and triple jump.

Table 3. Basic statistical parameters of motor abilities of the experimental group subjects on final measurement.

Var.	N	Mean	Min.	Max.	Std. Dev.	Skewn.	Kurtos.
M50 VS	20	8.42	8.28	9.35	14.97	-0.420	2.506
M20VS	20	3.36	3.29	4.18	2.46	0.141	-0.237
M20LS	20	2.62	2.53	3.15	2.67	0.199	2.744
MSKDM	20	187.26	158.00	210.00	4.83	0.014	-1.181
MTRSK	20	609.10	495.00.	630.00	2.09	-1.266	-0.967
MBLOP	20	390.85	268.00	430.00	9.28	0.012	-0.908

Legend: Arithmetic Mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. dev.), Skewness (Skewn.), Kurtosis (Kurtos.)

Table 4. Basic statistical parameters of motor abilities of the control group subjects on initial measurement.

Var.	N	Mean	Min.	Max.	Std. Dev.	Skewn.	Kurtos.
M50 VS	20	8.60	8.37	9.36	2.94	0.610	0.213
M20VS	20	3.32	3.34	4.19	3.31	0.062	1.178
M20LS	20	2.89	2.74	3.24	3.23	0.178	0.898
MSKDM	20	169.74	151.00	195.00	8.79	-0.057	-0.439
MTRSK	20	533.10	488.00	585.00	2.91	-1.148	-0.771
MBLOP	20	328.53	286.00	424.00	7.72	0.437	1.796

Legend: Arithmetic Mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. dev.), Skewness (Skewn.), Kurtosis (Kurtos.)

Analyzing the obtained results in Table 3 it can be noted that there are no statistically significant deviant results from the normal distribution and nominal values indicate that there have been positive shifts, as indicated by the Skewness results not exceeding 1.00. This indicates that the tests were not difficult but that they correspond to the researched population. The only deviation is in the triple jump (-1,266) .Homogenety of the results (Kurtosis) indicates that tests discrimination is good because the obtained values are below 2.75.

Essentially, the results obtained in the final measuring in the experimental group do not differ from the results in similar studies conducted locally which allows us the application of a multivariate method of data processing.

Analyzing Table 4 it can be concluded that there are no statistically significant deviances of the results from the normal distribution, which is positive. As with the experimental group on the initial measurement there are no significant results oscillations, which allows us the application of the more complex data processing methods.

Table 5. Basic statistical parameters of motor abilities of the control group subjects on final measurement.

Var.	N	Mean	Min.	Max.	Std. Dev.	Skew n.	Kurto s.
M50 VS	20	8.83	8.35	9.10	2.09	0.607	0.859
M20V S	20	3.96	3.42	4.28	1.61	0.342	-1.187
M20LS	20	2.77	2.71	3.19	6.95	0.910	0.896
MSKD M	20	171.43	152.00	198.00	6.91	0.694	1.765
MTRS K	20	538.62	491.00	593.00	15.32	-0.196	0.508
MBLO P	20	415.24	327.00	514.00	6.05	-0.106	-0.456

Legend: Arithmetic Mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. dev.), Skewness (Skewn.), Kurtosis (Kurtos.)

Inspecting the results in Table 5 it can be concluded that there is a normal sensitivity of the tests applied.

All results are within the range expected and are similar to the results reported by other researchers for the same population. Differences between the experimental and control group subjects on the initial measurement

Table 6. Multivariate analysis of variance of motor abilities between the experimental and control group subjects on the initial measurement

Wilks' Lambda	Rao's R	0
.698	1.47	.105

Legend: Values of Bartlett's test (Wilks' Lambda), Rao's R-approximation (R Rao's) and the level of significance (Q)

Table 6 shows the test results of the significance of differences in the overall (multivariate level) of all motor tests in the initial measurement in the experimental and control group; it is evident that there were no significant differences between the tested groups because the value of Q = .105 confirms this.

Table 7 shows the univariate or individual analysis of variance for the arithmetic means of motor abilities in the experimental and control groups in

the initial measurement. Based on the coefficient F-ratios and their significance (P-Level) it can be concluded that in the initial measurement there were no statistically significant differences in any of the motor tests. Differences between the experimental and control group subjects motor abilities on the final measurement

Table 7. Univariate analysis of variance of motor abilities between the experimental and control group subjects on the initial measurement

Tests	Mean (E)	Mean (K)	F-ratio	Q
M50 VS	8.63	8.60	1.28	.369
M20VS	3.58	3.32	1.42	.198
M20LS	2.93	2.89	1.08	.255
MSKDM	172.14	169.74	1.53	.162
MTRSK	528.15	533.10	1.12	.142
MBLOP	330.10	328.53	1.57	.253

Legend: arithmetic mean of the experimental group (Mean (EK), arithmetic mean of the control group (Mean (KO), value of F-test (F-ratio) and the level of significance (Q)

Table 8 Multivariate analysis of variance of motor abilities between the experimental and control group subjects on the final measurement

Wilks' Lambda	Rao's R	0
.225	9.28	.000

Legend: Values of Bartlett's test (Wilks' Lambda), Rao's R-approximation (R Rao's) and the level of significance (Q)

Analyzing Table 8 which shows the tests results of the significance of differences of the arithmetic means on the multivariate level, for all motor tests, for the experimental and control groups on the final measurement, there was found a statistical significance of differences at the level of Q = .000.

Consequently, in the applied system of motor abilities the experimental group subjects have achieved statistically more significant results compared to the control group subjects.

Table 9. Univariate analysis of variance of motor abilities between the experimental and control group subjects on the final measurement

Tests	Adj. Means (E)	Adj. Means (K)	F-ratio	Q
M50 VS	8.42	8.83	2.68	.047
M20VS	3.36	3.96	2.85	.050
M20LS	2.62	2.77	2.47	.048
MSKDM	187.26	171.43	6.17	.000
MTRSK	609.10	538.62	8.39	.000
MBLOP	415.24	390.85	7.25	.000

Table 9 shows the individual or univariate analysis of variance for the motor abilities tests. Based on the F-ratios and their significance Q it can be concluded that there was determined a statistically significant difference in the level of motor abilities between the experimental and control groups in all motor abilities.

Discussion and conclusion

Based on the results of this research and following the set hypotheses can be drawn: It has been confirmed that the experimental program, which lasted three months or 24 school periods, has had a statistically significant impact on the transformation processes and has indeed improved certain motor skills in the experimental group subjects. The subjects of the control group who implemented consistently PE curriculum, prescribed by the Ministry of Education of the Republic of Serbia, had no additional classes. They have also achieved good results, but they are not statistically significant, and are lower in comparison to the experimental group subjects' results. Although the obtained initial measurement results were approximately equal for the experimental and the control group as well, on the final measurement, the experimental group subjects have achieved statistically significantly better results than the control group. This leads us to the conclusion that the program brought forward by the active physical education teachers, the applied methods and appropriate loads enhanced better results than the regular physical education curriculum classes implementation.

References

Bjeković, G. & Tanović, I. (2010). Discriminative and canonical analysis of global quantitative changes in motor abilities of different faculties' freshmen students. *Sport and health, 5*(1), 22-29.

Bompa, T. (2006). *Teorija i metodologija treninga*. [Theory and methodology of training. In Croatian.]. Zagreb: National and university library.

Bradić, A., Rađo, I., Pašalić, E., Bradić, J., & Marković, G. (2008). *Strength training in competition period: practical examples from individual and team sports*, 6. Annual international conference Conditional preparation of athletes. Sarajevo: Faculty of sport and physical education.

Cicović, B. (2008) *Changes in motor, situational-motor and functional abilities in selected judokas under the influence of training activities*. Unpublished doctoral dissertation, East Sarajevo: Faculty of physical education and sport.

Duraković, M. (2008). *Kinantropologija: biološki aspekti tjelesnog vježbanja.* [Kinanthropology: biological aspects of physical exercising. In Croatian.]. Zagreb: Kinesiological faculty Universitho of Zagreb.

Fulurija, D., Cicović B., & Tošić, J. (2010). Dynamics of motor abilities development in soccer players aged 7 to 18. *Sport and health, 5*(1), 43-48.

Gajić, M. (1985). *Osnovi motorike čoveka*. [Basics of man's motorics. In Serbian.]. Novi Sad: Faculty of physical education.

Kocić, J. (2011). *Relacije antropometrijskih dimenzija sa rezultatima sprinterskih disciplina*. [Relations of anthropological dimensions with the results in sprinter disciplines. In Serbian.].Unpublished master theses, Pale: Faculty of physical education and sport.

Malacko, J. (2002). *Sportski trening*. [Sports training. In Serbian.]. Novi Sad: Faculty of physical education.

Malacko, J., & Popović, D. (2006). Relations of morphological and motor- functional variables and their influence on the aerobic capacity in 5th grade elementary schoolchildren, scientific paper in sport and physical education, Homo Sportikus, Sarajevo: Faculty of sport and physical education.

Marković, Ž. & Višnjić, D. (2008). *Motoričke sposobnosti dece osnovnoškolskog uzrasta.* [Motor abilities of elementary schoolchildren. In Macedonian.]. In A. Tufekčievski (Ed.), Proceedings of Scientific conference "Program - organizational, professional and scientific dimensions of school sport", 376-381, Pelister: Federation of Pedagogical Sport of Macedonia.

Milanović, D. (2007). Teorija treninga, Univerzitetski udžbenik. [Theory of training, University textbook. In Croatian.]. Zagreb: University of Zagreb.

Mišigoj-Duraković, M. (2007). *Morphological anthropometrics in a diagnostic procedure in athletes. Diagnostics of athletes' training level*. Proceedings. Zagreb: Zagreb Sports Fair, 9-17.

Pelemiš, M., Stević, D., Radojević, D. & Novaković, M. (2009). Transformation of morphological status of schoolchildren by programmed extra-curricular volleyball activities. XLV111 Congress of Anthropological Association of Serbia, Novi Sad: Gazette, ADJ.

Pržulj, D. & Cicović, B. (2012). Canonical relations between morphological dimensions and the results of repetitive strength among female students participating in sports recreational exercise. *Research in Kinesiology, 40*(2), 127-132.

Pržulj, D. (2006). *Osnovi antropomotorike.* [Basics of anthropomotorics. In Serbian.]. Pale: Faculty of Physical Education.

Pržulj, D. (2007). *Kondicijska priprema sportista.* [Conditional preparation of athletes. In Serbian.]. Pale: Faculty of Physical Education.

Pržulj, D. (2008). Effects of basic preparation for the development of motor and functional abilities of athletes. *Sport and health, 3*(1), 5-9.

Pržulj, D. (2009). Development of motor abilities in the function of plyometric training in athletes. *Sport and health, 4*(1), 58-62.

Pržulj, D. (2012). *Dijagnostika antropoloških karakteristika i nivo treninga sportista*. [Diagnostics of anthropological features and training level of athletes. In Serbian.]. Pale: Faculty of Physical Education and Sport.

Stojiljković, D. (2006). *Efekti kružnog metoda rada na razvoj somatometrijskih karakteristika, funkcionalnih sposobnosti i dinamičke snage učenika prepubertetskog uzrasta*. [Effects of circuit forms of work on the development of somatometric features, functional abilities and dynamic strength in pre-puberty schoolchildren. In Serbian.]. Unpublished Master's Thesis, Niš: Faculty of Physical Education.

Šnajder, V. (1988). *Atletika.* [Athletics. In Croatian.]. Zagreb: University of Zagreb.

Zaciorski, V. M. (1975). *Fizičke karakteristike sportista*. [Physical characteristics of athletes. In Serbian.]. Belgrade: Physical Education Association.

Željaskov, C. (2004). *Teorija i metodika treninga izdržljivosti.* [Theory and methodics of endurance. In Croatian.]. In D. Milanović & I. Jukić (Eds.), International scientific conference "Conditional preparation of athletes", 239-245, Zagreb: University of Zagreb, Zagreb Sports Association.

UTJECAJ SPECIFIČNOG VJEŽBANJA NA RAZVOJ MOTORIČKIH SPOSOBNOSTI DJECE OSNOVNOŠKOLSKOG UZRASTA

Sažetak

Na uzorku od 40 ispitanika, učenika niških osnovnih škola, muškog spola, kronološke dobi 13 godina (+ - 6 mjeseci), izvršeno je longitudinalno istraživanje s ciljem da se utvrdi utjecaj specifično programiranog fizičkog vježbanja na razvoj motoričkih sposobnosti kod ispitanika koji su pored redovne nastave fizičkog vaspitanja bili podvrgnuti i trenažnom radu u školskom sportskom društvu (eksperimentalna skupina 20 ispitanika). Kontrolna grupa je radila po programu Ministarstva prosvjete RS i nije imala dodatno vježbanje (20 ispitanika). Postavljene su 2 hipoteze koje su polazile od pretpostavke da će dodatni rad statistički značajno utjecati na pozitivne transformacijske procese kod ispitanika eksperimentalne skupine. Mjerni instrumenti za procjenu motoričkih sposobnosti bili su: 1. 50m visoki start, 02:20 m visoki start, 3. 20m leteći start, 4. skok u dalj iz mjesta, 5. troskok iz mjesta, 6. bacanje leoptice. Eksperiment je trajao 24 školska sata ili 3 mjeseca. Izvršena su 2 mjerenja, inicijalno i finalno, nakon zavšetka eksperimenta. Dobiveni rezultati su statistički obrađeni i prikazani kroz 8 tablica na bazi kojih su izvedeni zaključci. Potvrdjene se obje hipoteze jer je eksperimentalni program statistički značajno utjecao na poboljšanje motoričkih sposobnosti ispitanika eksperimentalne skupine.

Ključne riječi: *specifično programirano vježbanje, motoričke sposobnosti, školsko sportsko društvo, transformacijski procesi, učenici osnovne škole*