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**DEVELOPMENT OF DYNAMIC STRENGTH
IN ELEMENTARY SCHOOL PUPILS****ABSTRACTS**

On a sample of 50 male subjects of elementary schools pupils in Nis aged 12 a study was conducted in order to determine the effect of the application of the circuit forms of work in the physical education curriculum, with the aim to improve the explosive and repetitive strength of the regular PE classes pupils. In addition, the aim was also to determine the differences in the dynamic strength between the pupils in the experimental and control groups. The experiment design was to divide the total sample into two subgroups with 25 subjects assigned to each group. The experimental group attended regular PE classes for a period of 3 months totalling 25 classes. After the shaping exercises the group performed special exercises to develop explosive and repetitive strength using circuit form of work for a period of 10-12 minutes, after which they continued conventional form of work in the main part of the class. The control group (25 subjects) for the same time performed a regular physical education curricular program provided by the Ministry of Education of the Republic of Serbia. Two measurements were made of the dynamic strength at the beginning and in the end of the experiment on the overall sample using a battery of 6 tests (3 for repetitive strength and 3 for explosive strength). The results were statistically processed and presented in 4 tables.

The results analysis showed that the experimental group exhibited statistically significant improvement of dynamic strength as compared to the control group who also improved their dynamic strength, but these results are not statistically significant.

Key words: *repetitive strength, explosive strength, analysis of the circuit form of work, an experimental group, a control group.*

1. INTRODUCTION

Physical education curriculum largely depends on many factors, especially on the application of the appropriate methods and forms of work, increasing scope and intensity of the load in a class, use of different modalities of sports - training process, which in other words means that teaching process increasingly needs to take on the elements of sports training. Besides, it is important to continuously monitor transformation processes occurring under the influence of this kind of work, especially in the sphere of the motor and functional abilities, because only in this way can one notice positive changes which is of great importance for the

further development of science and educational process as well. That was the research focus of a number of authors including Bangsboo, 1994; Findak, 1995; Matveyev, 2000; Milanović et al, 2003; Antekolović et al, 2003; Stojiljkovic, 2003 and 2006.

The subject of this research is the application of the circuit form of work in physical education teaching, with the aim to improve the dynamic strength of the pupils included in regular PE classes. The main objective was to determine the effects of this kind of work in physical education teaching, the possibility of its continuous use not only in increasing the dynamic strength, but also of other basic complex motor abilities. The aim of this study was to determine the differences in the development of dynamic strength between the subjects of the experimental and control group.

2. MATERIAL AND METHODS

The study was conducted on a sample of 50 male subjects, elementary school pupils in Nis, aged 12 years + - 6 months. The sample was divided into two subsamples: experimental and control group, with the same number of subjects (25 pupils each).

To assess dynamic area a battery of six tests was applied, three of which were used to determine the repetitive strength (squats -MČUČ, pushups - MSKLE and trunk lifting on the Swedish bench-MDTK) and three to determine explosives strength (throwing ball -MBLP, standing triple jump -MTRS and standing long jump -MSDM). (These tests were taken from the research of Kurelić N. et al, published in the monograph "The structure and development of the morphological and motor dimensions of the youth, Belgrade, 1975).

Comparison of qualitative differences in the expression of the dynamic strength was carried out by means of the multivariate analysis of variance.

2.1. Experimental program

A circuit work system of polygon type for a few working stations was applied.

At three working stations exercises to develop repetitive strength were performed, and in the other exercises to develop explosive strength. At every working station experimental group subjects performed in advance prepared exercise program with an adequate number of series and repetitions (in accordance with their intraindividual abilities and characteristics). Relaxation intervals between the time series were slightly shorter than normal, due to the limited exercise time of 10-12 minutes. Immediately after the end of the experimental part of the program the main part of the class was implemented as a continuation of the exercise according to the current curriculum with the corrected and abridged teaching unit. Total experiment lasted 25 consecutive classes in the quarterly working cycle. Control group subjects during that time had regular classes without additional contents according to the current PE curricula of the Ministry of Education of the Republic of Serbia.

The experiment consisted of implementing a set of exercises to develop explosive and repetitive strength in the first part of the main part of the class (immediately after the shaping exercises) for 10-12 minutes.

To obtain relevant data two measurements were made of all subjects - both of the experimental and control group, right at the beginning of the experiment (initial measure-

ment) and in the end, after three months of work (final measurement), whereby previously mentioned batteries of tests to assess repetitive and explosive strength were used.

3. RESULTS AND DISSCUSION

Determination of the normal distribution of the explosive and repetitive strength results tests was made by the Kolmogorov-Smirnov procedure, which showed that the results were normally distributed and that data could be further processed in a more complex manner.

Table 1. Significance of the differences between the initial and final measurement of the dynamic strength tests in the latent area in the experimental group.

WILKS'S LAMBDA TEST	0.532
RAO's F-approximation	0.687
Q	0.034

The obtained values of the significant differences of all arithmetic means for the dynamic strength tests (explosive and repetitive strength) between the initial and final measurement in the experimental group (Table 1), in the latent area indicate that there is a statistically significant difference, given that WILKS'S LAMBDA is 0.532 which by applying RAO's F-approximation of 0.687 gives the significance of the results of $Q = 0.034$, meaning that during the experimental period a statistically significant difference in the dynamic strength was reached.

Table 2. Significance of the differences between the initial and final measurement of the dynamic strength tests in the manifest area in the experimental group.

Tests	Measurements	N	P-LEVEL
MČUČ	IN : FI	25	0.026*
MSKL	IN : FI	25	0.029*
MDTK	IN : FI	25	0.040*
MBLP	IN : FI	25	0.073*
MTRS	IN : FI	25	0.038*
MSDM	IN : FI	25	0.034*

The resulting values of the significance coefficient (P-LEVEL) on the level of $P < 0.005$ (Table 2) indicate that at the end of the experiment there was a statistically significant increase in the dynamic strength, except for the ball throwing test. This increase in the dynamic strength is probably due to the influence of the applied methods and means of work in the work stations in a circuit system of operation, which had a positive impact on the transformation and adaptation processes in the experimental group subjects bodies.

Table 3. Significance of the differences between the initial and final measurement of the dynamic strength tests in the latent area in the control group

WILKS'S LAMBDA TEST	0.384
RAO-s F-approximation	0.432
Q	0.084

The obtained results (Table 3) in the latent area indicate that in the control group there did not occur, in the course of the experimental period, statistically significant results on the level of the dynamic strength, although there were some improvements of the overall strength development.

Table 3. Significance of the differences between the initial and final measurement of the dynamic strength tests in the manifest area in the control group.

Tests	Measurements	N	P-LEVEL
MČUČ	IN : FI	25	0.079
MSKL	IN : FI	25	0.031
MDTK	IN : FI	25	0.066
MBLP	IN : FI	25	0.082
MTRS	IN : FI	25	0.066
MSDM	IN : FI	25	0.043

At the individual level results of the coefficients of significance (P-LEVEL) on the level of $P < 0.05$ indicate that at the end of the experimental period there were no statistically significant improvements in the dynamic strength, except in the repetitive strength test - pushups (MSKLE - 0.031). The reason for the lack of influence of the physical education curricula on the dynamic strength in this group of subjects is probably the result of a slightly weaker methodological organization of the teaching process, especially in the implementation of the volume and intensity of work, as well as the application of more modern forms of work in the development of dynamic strength. At first glance, there are some improved results, but they are not statistically significant.

4. CONCLUSION

1) The results obtained by the analysis of variance in the area of the explosive and repetitive strength, both in the latent and in the manifest space, indicate that there was a statistically significant increase in the level of the dynamic strength in the experimental group, which was expected, whereas in the control group subjects there also was some mild increase in the dynamic strength, but the statistical significance emerged only in the segment of the development of the repetitive strength in shoulders and arms, which also was expected, because the subjects of the control group had a regular physical education curricula classes that after all gave certain results.

2) Development of dynamic strength in physical education teaching is possible if one knows the latent anthropological dimensions of the pupils and if one strictly applies special forms of work in order to develop specific motor abilities among which one includes "circuit training".

3) For the development of the dynamic strength very important role is assigned beside the exogenous factors, to the endogenous factors, particularly genetic ones having a major impact on the development of the speed and the explosive strength.

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