

## THE EFFECTS OF THE STATION EXERCISE METHOD ON THE DEVELOPMENT OF STRENGTH AMONG ELEMENTARY SCHOOL STUDENTS

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(Research note)

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### Abstract

*The aim of the research was as first to carry out the evaluation of the dynamic strength (repetitive and explosive strength) of our participants, a sample of 60 elementary school students from Niš, aged  $11 \pm 6$  months, at the initial and final measuring, and then in the variables of repetitive and explosive strength to determine the multivariate and univariate statistical significance of the difference in means, in order to obtain information regarding the relevance of the studied parameters in the managing, diagnosing, planning and control of the teaching process. The multivariate statistical significance of the difference in dynamic strength between the arithmetic means at the initial and final measuring was obtained at the .00 level ( $Q=.00$ ). By means of the univariate procedures, a statistically significant difference was determined for all of the variables of explosive strength, also at the .00 ( $p=.00$ ) level. On the basis of the obtained results we can conclude that the obtained statistically significant differences in the dynamic strength of the experimental group, when compared to the control group, primarily occurred due to the adaptive processes to which the participants were exposed during motor exercises as a part of their physical education classes, through the use of the 'station' method.*

**Keywords:** motor tests, station exercise method, physical education classes, analysis of variance, elementary school students

### INTRODUCTION

For the successful realization of the program tasks, which are part of physical education classes, the quality of motor skills is very important, especially the latent dimensions – repetitive and explosive strength, which, according to certain authors (Metvejev, 2000), are manifested in most of the program tasks in physical education classes.

Due to the relatively small number of studies of this size in the field of physical education teaching, it is necessary to investigate the influence of motor exercises on the development of repetitive and explosive strength by using the "station" method. The research problem was aimed at evaluating: whether the means, methods and loads applied in the process of the realization of the "station" work method can influence the statistically significant development of dynamic strength at the end of the experimental period (during the final when compared to the initial measuring) in the case of the experimental group of participants. In addition, it

is necessary to answer the question of whether the experimental group differs in a statistically significant manner at the level of dynamic strength from the control group of participants at the final measuring. The aim of the research was first to evaluate the dynamic strength of the participants (repetitive and explosive strength) at the initial and final measuring, and then in the variables of repetitive and explosive strength to determine the multivariate and univariate statistical significance of the differences in arithmetic means, in order to obtain information on the relevance of the studied parameters for the managing, diagnosing, planning, programming and the control of the teaching process.

### THE METHOD

The research was carried out on a sample of 60 participants, all of them elementary school students from Niš, aged  $11 \pm 6$  months. The sample was divided into two sub-samples: an experimental (30) and a control sample (30).

The motor status of dynamic strength

was evaluated by means of six tests, three for the evaluation of repetitive strength (squats-MČUČ, push-ups-MSKL and torso lifts on a vaulting box-MDTK) and three for the evaluation of explosive strength (throwing a small ball-MBLP, the triple standing jump-MTRS the standing depth jump-MSDM). The tests were taken from the research of Kurelić, Momirović, Stojanović, Šturm, Radojević, & Viskiće-Štalec, (1975).

The comparison of the quantitative differences of the variables of dynamic strength was determined with the help of the multivariate analysis of variance, while the effects of the experimental exercise program on the development of dynamic strength were determined by means of the multivariate analysis of covariance (Statistika, version 7.0).

### *The experimental treatment*

In this research the experimental program was made up of the exercises for the development of explosive and repetitive strength, which were realized in the second part of the basic phase of the physical education class (immediately following the shaping exercises) for a period of 15 minutes. The experiment was realized over a period of 12 weeks, which made up 24 classes in total. We used the "station" system, consisting of six work stations. At three of the work stations an exercises for the development of repetitive strength were performed and at the three remaining stations, exercises for the devel-

opment of explosive strength were performed. At each of the work stations (stops), the participants of the experimental group performed a previously determined program of series and repetitions (in accordance with their individual abilities and skills). The relaxation intervals between the series were shorter for the exact amount of time it was necessary to move from one work station to the next due to the limited duration of the exercise. Prior to the experimental program within the A part of the class, we realized the specific unit prescribed by the current class program. The participants of the control group only realized the unit scheduled by the plan and program of the physical education program, without the experimental treatment.

### **RESULTS AND DISCUSSION**

Table 1. shows the results of the multivariate analysis of covariance between the participants of the experimental and control group at the final measuring with a partialization and neutralization of the differences in the means at the initial measuring, which indicate the presence of a statistically significant inter-group difference between the motor skills since WILK'S LAMBDA has a value of .207, with RAO's F-approximation with a value of 10.86 gives a significant difference at the  $Q = .000$  level. Thus, in the applied system of motor skills of the participants, statistically significant differences were determined.

Table 2. shows the univariate analysis of

*Table 1. The multivariate analysis of covariance of the dynamic strength between the experimental and control group at the final measuring*

Wilks' Lambda	Rao's R	Q
.207	10.86	.000

*Table 2. The univariate analysis of covariance of the dynamic strength between the experimental and control group at the final measuring*

Tests	Adj. Means (E)	Adj. Means (C)	F-ratio	P-Level
MČUČ	10.65	14.62	4.58	.001
MSKL	5.15	9.82	6.77	.000
MDTK	12.55	16.73	5.42	.000
MBLP	215.23	232.60	5.45	.000
MTRS	406.20	429.25	4.45	.002
MSDM	156.90	164.66	6.42	.000

covariance of the tests for dynamic strength through the comparison of the results of the arithmetic means of the experimental and control group at the final measuring when compared to the initial one. On the basis of the F-relation coefficient and their significance (P-Level) we can conclude that a statistically significant difference in the all of the tests of dynamic strength can be determined.

The obtained results of the multivariate and univariate analysis of covariance of the motor skills (tables 1. and 2.), at the final when compared to the initial measuring, indicate that under the influence of the transformation process of the model of work at various exercise stations, a positive and statistically significant changes occurred to the dynamic strength (explosive and repetitive) in the case of the experimental group of participants. The applied methods and means of motor exercises increased the ability of the experimental group to activate the motor units more quickly and more fully with a high level of load, which enabled the increased activity of agonistic muscles and the increase in the strength of the entire body.

In the articles published by some researchers (Malacko, 1982; Zdanski, Galić, 2002) it was confirmed that an increase in the level of dynamic strength in the case of elementary school students was the most appropriate, if the load in the teaching process suited the biological and psychological features of the human body. According to them, it is a gradual increase in the load of the teaching process, with contents of speed-explosive features and the use of one's own abilities, especially the muscle strength to optimally engage all the regions of the body, by means of which the use of energy and functional capacities were significantly increased in the case of the experimental group.

The results of the analysis of covariance (tables 1. and 2.) have shown that the participants of the experimental group at the final measuring differ in a statistically significant manner in terms of the increased level of dynamic strength in relation to the control group of participants, which can be ascribed to the influence of the exercises of the station work form, which also had a varied influence on the development of the other features of the anthropological characteristics.

## CONCLUSION

The research completely confirmed the hypothesis that by using the work "station" method in the second part of the main phase of the physical education class, for a period of

24 classes, we can realize statistically significant changes in dynamic strength, defined by explosive and repetitive strength. In addition, the determined statistically significant level of the experimental when compared to the control group at the final measuring can primarily be explained by the influence of the "station" method, the regime and character of the work (the training method), the intensity, duration and means of exercise (specific conditions), as well as by the load for the manifestation of the effectiveness of the "station" method for the development of the abilities and skills of the experimental group.

The results of the explosive and repetitive strength of the experimental and control group can be used as a reliable basis for a more comprehensive overview of the effects of physical education classes in schools and the innovation of the measuring instruments and models used within the teaching process for the development of the explosive and repetitive strength for participants aged 11.

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## ЕФЕКТИ НА ВЕЖБАЊЕТО СО МЕТОДАТА НА СТАНИЦИ ВРЗ РАЗВОЈОТ НА ДИНАМИЧКАТА СНАГА КАЈ УЧЕНИЦИТЕ ОД ОСНОВНИТЕ УЧИЛИШТА

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(Испиражувачка белешка)

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### Апстракт

Целата на истражувањето беше на примерок од 60 испитаници – ученици од основните училишта во Ниш, на возраст од 11 години  $\pm$  6 месеци, најнапред да се изврши проценување на динамичката снага (репетитивната и експлозивната) на иницијалното и финалното мерење, а потоа да се утврди мултиваријантната и униваријантната статистичка значајност на разликата меѓу аритметичките средини, заради добивање информации за релевантноста на истражуваните параметри во управувањето, дијагностицирањето, планирањето, програмирањето и контролата на наставниот процес. Резултатите од истражувањето покажаа мултиваријантна статистички значајна разлика на нивото од .01 меѓу аритметичките средини на иницијалните и финалните мерења во сите третираните варијабли за проценување на динамичката, односно на експлозивната и реперитивната снага на испитаниците. Разликата беше дефинирана со подобри резултати на испитаниците од експерименталната група кои беа опфатени со вежбањето на методата на станици во однос на испитаниците од контролната група кои наставата по физичко воспитување ја реализираа според актуелната програма. Ваквите резултати, секако дека, првенствено се последица на адаптивните процеси од вежбањето со примена на методата на станици.

**Клучни зборови:** *моторни теснови, настава по физичко воспитување, анализа на варијансаи, ученици од основно училиште*

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