

**ORIGINAL SCIENTIFIC PAPER****Davorin Okiljević,**

Coach school of Martial arts "Ogi" in Kruševac

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**THE EFFECTS OF THE SPRINTING SPEED MODEL ON THE DEVELOPMENT OF MOTOR ABILITIES IN FOOTBALLERS****Abstract**

*The sample of participants was composed of 56 masculine subjects, aged  $15 \pm 6$  months, who regularly, twice a week, took part in Physical Education classes and trained in sport football clubs of Niš, three times a week. Total sample was randomly divided in two subsamples. First subsample of experimental group was composed of 28 subjects who regularly took part in Physical Education classes and were included in training process in football clubs. In the main part of Physical Education classes, these participants realized sprinting speed model intended to development of motor abilities. Second subsample of control group, composed of 28 subjects who also took part in Physical Education classes and included in training process in football clubs but in the main part of Physical Education teaching, they realized program contents of regular Physical Education teaching process. Experimental treatment for both groups of participants lasts 24 classes of regular Physical Education classes, twice a week per 45 minutes. The aim of the research was to examine transformational process of motor abilities under the influence of sprinting speed model for development of players motor abilities, realized in regular Physical Education classes, in final compared to initial measurement at experimental group of participants. The specific objective of the research was to identify the transformational processes of motor abilities, in final compared with the initial measurement, under the influence of programs of regular teaching Physical Education process at control group of the participants. An additional objective was to determine the differences in the final measurement of motor abilities between the experimental and control groups of participants. For the assessment of motor abilities of both group of, six motor tests were applied. Repetitive power was evaluated by tests: trunk lifting on Swedish bench (MDTK), squats for 30 seconds (MČ30') and push-ups (MSKL). Explosive power was evaluated by using tests: long jump from place (MSDM), triple jump from place (MTRS) long ball toss (MBLP). Analysis of covariance showed that they are statistically significant differences between experimental and control group of participants, at the final measure compared to initial, so that experimental group has a higher level of motor abilities dimensions of explosive and repetitive strength at the level of ( $Q=.000$ ). It is confirmed that exist statistically significant influence of applied sprinting speed model on development motor abilities at experimental group of participants at secondary school students.*

**Key words:** experimental group and control group, speed model, antropological characteristic, discriminative analysis.

## 1. INTRODUCTION

Football is an extremely complex and dynamic game which is characterized by continuous rapid change of actions from one to another goal, in which both teams are trying to win by achieving the higher number of goals than the opposing team. Football game is a very composite sport activity which takes place on a relatively large pitch and with frequent contact with players of opposite teams (*Jerković i Barišić, 1997*).

Transformational processes of abilities and characteristics in the process of training work with footballers are only possible with adequate planning, programming and control of training process, with pre-defined objectives, means and methods of transformation of anthropological status dimensions.

For the purposes of more objective planning and programming of the training process, it is necessary to carry out the diagnostic tests of footballers' abilities and characteristics, which can be realized with measuring instruments for the determination of relevant and objective, quantitative and qualitative data. Without data of the state of anthropological characteristics and degree of motor abilities assimilation, planning and programming of training work can not be adapted to specific needs and capabilities of players (*Zdanski i Galić, 2002; Komesis, 2003; Višnjić, 2006; Duraković, 2008; Projević, 2009*).

Footballers' motor activity characterizes players high and long jumpings, kicking at soccer balls, quick movements of arms and legs, which is especially present in short shares. Consequently players must be fully operational for the manifestation of speed at the maximum level and they should have specific stamina so as to run over a shorter or a longer paths in high tempo (*Komesis, 2003*).

Speed of frequency movements in athletes, and thus the players, according to some researchers (*Jerković i Barišić, 1997; Malacko i Rađo, 2004; Bompa, 2006*) is determined by the speed of muscle contraction which depends on the morphological and biochemical characteristics (proportion of white and red fibers). It is according to these researchers genetically determined 90-95% and in large correlation with the motor strength and endurance.

The basic requirement of movement efficiency in running is the rational technique, which enables that players' motor potential come into their own. Insufficiently learned running technique, becomes a disruptive factor in movement regulations and the limiting factor in the footballer's motor capacity expression, using more energy and leading to the appearance of earlier fatigue.

It was determined that repetitive strength is especially important for development of the sprinting speed, because its optimal level allows muscles to express force in a cyclic mode based on alternating contractions and relaxations of trunk muscles, almost in all sports activities, but most commonly in athletic walking and running disciplines of longer duration (*Radosav, 1990; Malacko, 2010*).

Explosive strength is the ability that enables the athletes to achieve maximum acceleration of his own body, an object or partner. It is manifested in sprint as well as in activities of throwing and shooting, jumping and hitting.

The aim of the research was to determine the transformational processes of motor abilities, in the final compared with the initial measurement, under the influence of sprinting speed model on the development of players motor abilities in regular Physical Education teaching at the experimental group of the participants. The specific objective of the research was to identify the transformational processes of motor abilities, in final compared with the initial measurement, under the influence of programs of regular teaching Physical Education process at control group of the participants. An additional objective was to determine the differences in the final measurement of motor abilities between the experimental and control groups of participants.

## 2. METHOD

The research was carried out on a sample of 56 participants, aged  $15 \pm 6$  months, who were, in addition to regular Physical Education classes, involved in training process in football clubs in Niš region.

Total sample was randomly divided into two subgroups: subsample of experimental group was consisted of 28 subjects. In this group were classified participants who, in addition to regular Physical Education teaching process, two times a week per 45 minutes, (24 classes in total, were involved in training process in football clubs. In regular Physical Education teaching process, in the main part of class, these participants realized motor exercises defined by model of sprinting speed, loads and training methods which are assumed to have the greatest impact on results in football game. The young football players were subjected to programmed football training in football clubs, three times a week per 60 minutes, during the experimental three-month period.

Second subsample consisted of 28 participants of control group, attended regular Physical Education classes and were involved in training process in football clubs. During three month, twice a week, In regular Physical Education classes, in the main part of the class, these participants realized program contents of regular Physical Education teaching.

For the assessment of motor abilities of young footballers were applied standard measuring instruments which were taken from the research of *Kurelic et al. (1975)*. In total six motor tests were applied. Repetitive power was evaluated by using tests: trunk lifting on Swedish bench (MDTK), squats for 30 seconds (MČ30') and push-ups (MSKL). Explosive power was evaluated by using tests: long jump from place (MSDM), triple jump from place (MTRS) long ball toss (MBLP).

The measurement of motor abilities are conducted by experienced Physical Education teachers. During the three-month lasting training process in football club and three months training in Physical Education classes, the presence of subjects was registred and transcribed.

At the end of the experimental period, the final measurement of motor abilities for both groups of participants was conducted.

To determine the effects of the model of sprinting to the development of motor skills in patients, applied the canonical discriminant analysis. The obtained data were processed by canonical discriminant analysis.

In class regular physical education teaching in the experimental group were applied motor exercises defined model sprint speed and load and working methods that have been found that most influence the results of motor skills. Basic orientation exercises for the development of sprint speed was focused on increasing the optimal range of motion, except to be implemented properly and freely without unnecessary waste of energy. The development of the sprint speed was a function of the adoption of new and diverse movement that to enrich motor respondents. In addition to the implementation model of sprint speed exercises, special attention is paid to increasing the flexibility and coordination of movements for faster adoption of technical and tactical knowledge, as well as increased joint mobility and flexibility of the spine. Between these exercises rest intervals were long enough for recovery.

To determine the effects of the sprinting speed training model on the development of motor abilities in football players, a canonical discriminative analysis was applied, calculated in statistical package Statistika 7.0.

### 3. RESULTS

**Table 1.** Significance of isolated discriminative function of motor skills of experimental group

Disc Func.	Eigenvalue	Cannonical R	Wilks' Lambda	Chi-Sqr.	df	P-Level
1	4.452	.76	.192	124.56	6	.000

Legend: squared coefficient of discrimination (Eugenvalue), the coefficients of canonical correlation (Cannonical R), Bertlet test values (Wilks' Lambda), size of the chi square test (Chi-Sqr), degrees of freedom (df), the level of significance of the coefficient of determination (P -level)

In table 1 is shown significant discriminative function of high intensity that separates the results of the initial and final testing at the level of 76%, what is shown by value of coefficient of canonical correlation (CR=.76). The discriminative force (Wilks' Lambda) is .192, and the difference between the initial and final testing at experimental group is statistically significant (P=.000 level), what is contributed by the value of Chi-Sqr. ( $\chi^2=124.56$ ).

**Table 2.** Factors structure of the isolated discriminative function of experimental group

Motor agility variables	Root 1
MDTK	0.624
MČ30'	0.576
MSKL	0.459
MSDM	0.723
MTRS	0.487
MBLP	0.570

In Table 2 is shown the structure of discriminative function of motor variables impact in forming the significant discriminative functions. The presented centroids of groups represent the arithmetic means of the initial and final measurement. Obtained results show that the largest contribution to the discriminative function has test Long jump from place (MSDM), than Trunk lifting on Swedish bench (MDTK), slightly less Squats for 30 seconds (MČ30') and Long ball toss (MBLP) and least push-ups (MSKL).

**Table 3.** Multivariate analysis of covariance of motor abilities between experimental and control groups at the final measurement

Wilks' Lambda	Rao's F	Q
.186	7.45	.000

Legend: Bertlet-test value (Wilks' Lambda), Rao' F-approximation (R Rao's) and Significance level (Q)

In Table 3, results of multivariate analysis of covariance (MANCOVA) between experimental and control group on final measurement, showed that there is statistically significant intergroup differences in motor abilities, because of the value of WILK'S LAMBDA test which is .186, what with Rao's F -approximation which is 7.45, gives significant difference

at level of the  $Q=.000$ . Accordingly, in the applied system of motor abilities are determined statistically significant differences.

**Table 4.** *Univariate analysis of covariance of motor abilities between experimental and control groups at the final measurement*

Tests	Mean (E)	Mean (K)	F-test	Q
MDTK	19.85	15.62	4.34	<b>.003</b>
MČ30'	22.50	18.63	7.45	.000
MSKL	8.31	5.75	6.77	.000
MSDM	189.53	174.20	7.64	.000
MTRS	487.78	35.78	5.89	.001
MBLP	368.43	32.40	4.79	.002

*Legend: Arithmetic mean of the experimental group (Mean E), arithmetic mean of the control group (Mean K), the value of F-test (F-ratio), Significance level (Q)*

In Table 4 is shown the univariate analysis of covariance of motor abilities tests, calculated by comparing the arithmetic means of the experimental and control groups on the final measurement. On the basis of the coefficients of F-test and their significance (Q), can be concluded that there are the statistically significant difference of motor abilities between the experimental and control group in all of the applied tests of repetitive and explosive strength.

#### 4. DISCUSSION

The obtained results showed that the adaptive model of sprinting speed influenced on statistically significant improvement of results between the two testing of repetitive and explosive strength at the experimental group of participants.

Based on the determined statistically significant differences reported in the Results section, it can be argued that the duration and structure of specially adapted sprinting speed program led to improvement of the level of motor abilities dimensions of repetitive and explosive strength at the experimental group of participants.

This increase of the dimensions of explosive and repetitive strength at the experimental group compared with control, is probably result of high-quality realization of the applied model of sprinting speed, and that resulted in more efficient using of their abilities, especially the muscular strength in order to optimally engage all regions of the body, because using of energy and functional capacities were significantly increased.

Justification of the obtained results is confirmed by several authors (*Čoh, 1988; Rakočević, 1996; Brown, Ferrigno i Santana, 2000; Zdanski i Galić, 2002; Mitić, 2010; Fulurija, Cicović i Tošić, 2010*), who stated that methodically properly designed application model of sprinting speed motor exercises has a big impact on increasing level of the tested abilities.

The adaptive program of sprinting speed is absolutely suitable to motor status of participants. Duration of educational adaptive program and sprinting speed training in this study may be conditional form for planning of physical activities of repetitive and explosive strength, and, besides that, tests that are used can be taken as a measure for assessing the achieved results.

## 5. CONCLUSION

The results of research carried out on a sample of secondary school students of experimental group suggest that the applied methodological design of the main part of the regular Physical Education classes for development of sprinting speed, contributed to a statistically significant increase of repetitive and explosive strength motor dimensions.

According to Malacko (2002) research, at students aged 15 years, differentiated repetitive and explosive strength, aren't sufficiently developed, but they are contained in the complexity of morphological dimensions, which just means that they achieve this strength due to increased values of sprint running in the regulation of the intensity and duration of excitation.

Due to the sample size and influence of various factors on the development of motor abilities of repetitive and explosive strength, the results of this research can serve as good guidelines in order to improve the determination of homogeneous groups in regular Physical Education classes.

The generalization of these results requires a large-scale research, because similar conclusion at older students' population is not possible, because the phase of accelerating maturation certainly influences on the differences between the children in relation to motor abilities.

The data obtained on testing can be useful as a scientifically based starting point to Physical Education teachers and coaches for adequate approach to planning, programming, implementation and monitoring of the training process with this age students.

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Correspondence: Davorin Okiljević

Trener u školi borilačkih veština "Ogi" u Kruševcu

Adresa: Nikola Tesla 14, Kruševac

E - mail: [drokiljevic@gmail.com](mailto:drokiljevic@gmail.com)

Tel: 064-477-3333; 037- 3100-740