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The Effects Of Programmed Exercise On The Development Of Explosive Strenght In Young Student Athletes, Basketball Players

Marko Nikitovic[1], Rosario D'Onofrio[2], Oussama Gaied Chortane[3], Elmoetez Magtouf[3], Laishram Santos Singh[4], Milan Zelenović[1].

[1]*Faculty of Physical Education and Sport, University of East Sarajevo.*
[2]*Faculty of Medicine and Surgery, Sapienza Universty of Rome.*
[3]*Higher Institute of Sport and Physical Education of Ksar-Said, Universite de La Manouba, Tunis 2010, Tunisia.*
[4]*Department of Physical Education and Sports Science, Manipur University,Canchipur.*

Abstract: *The aim of this research is to determine the effectiveness of the exercise and training program for the development of explosive strength in young basketball players. The research was conducted on a sample of 12 male elementary school students from the area of East Sarajevo, aged 13-14 ±6. In addition to regular physical education classes, the participants train basketball in the Basketball Club "Slavija" (pioneers and cadets) and were subjected to an experimental program for the development of explosive strength, which was carried out within 24 training sessions lasting three months. Three motor tests were applied, namely: standing long jump - SLJ; throwing the medical kit from the chest from the basketball stance - TMCB; running 20 meters from a high start - S20. T-test was used to analyze possible differences between the initial and final measurements. It was concluded that there is a significant impact of the proposed experimental program (SLJ, p =,000; TMCB, p =,006; S20, p =,000) on the improvement of explosive strength in elementary school students.*

Key words: Explosive strength, basketball, motor skills, experimental group.

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Corresponding Author : *Milan Zelenović (milanzeleni13@gmail.com, +387 66 513 469), University of East Sarajevo, Faculty of physical education and sport, Adress: Aleksa Šantić no.3, East Sarajevo 71123, Bosnia and Herzegovina*

Introduction

In modern sports, athletes and coaches face ever greater competitive demands, which leads to the need to constantly improve training processes and technologies. Therefore, it is necessary that the training is planned so that all types of sports preparation (technical, tactical, conditioning, etc.) are represented and that the best ratio is harmonized. Basketball is considered to be one of the most important sports and therefore great efforts are being made to modernize it[1-4], and it is followed by short high-intensity activities with alternating periods of active or passive rest that take place in a certain space and time[5]. Basketball is a very active sport with frequent changes of speed, a large number of jumps and active use of all muscle groups.

Training with children and youth should be based on the development of anthropological characteristics[6], where effective procedures are applied in the selection of the content of work methods, organizational forms, intensity of workload and recovery. Positive effects of transformational processes can be expected only under the condition that the methodical design of the training work is adapted to the individual abilities and characteristics of the subjects[7].

Explosive strength represents the ability of an athlete to achieve the greatest possible strain in a short time interval.As such, it represents one of the determinants of success in all activities that require the manifestation of maximum muscle force in the shortest possible time unit[8]. It manifests itself in activities such as throwing, jumping, kicking, sprinting and is very important in many sports (basketball, volleyball, handball, athletics, etc.). In basketball, explosive strength is manifested through different types of jumps, starting accelerations, sudden changes in the direction of movement, deceleration, sudden stops and passes. Knowing the explosive power of basketball players of different ages is directly related to the effects of training, it facilitates the choice of methods, the process of planning and programming training for the coach[9,10].

It has been established[9-14] that training work to increase the level of explosive strength strongly affects the ability of muscles to explosively exert stress and increase the level of functional abilities. Previous studies of the training process for the development of explosive strength confirm such findings[15,16]. There is a large number of studies that have dealt with explosive strength at different ages[17-20]. It has been established that explosive strength can be developed through organized training that should be carried out methodically and rationally when looking at the effect of training on jumps, throws, sprints[13,21-24].

Main aim of this study is to determine the effectiveness of exercise and training programs for the development of explosive strength in elementary school students, basketball players,, i.e. to see if there will be statistically significant changes in the final results compared to the initial measurement in the experimental group.

Methods

Sample of participants

The research was conducted on a sample of 14 male participants, elementary school students from East Sarajevo, aged 13-14 years ± 6 months, who made up the experimental group. In addition to regular physical education classes, the participants train basketball at the "Slavija" Basketball Club, where they met all health and other criteria at the time of the research.

Sample of variables

Tests were used to assess explosive power: standing long jump (SLJ), chest throw from a basketball stance (TMCB), 20-meter run from a high start (S20).

Experimental program

Experimental procedures for the development of explosive strength were carried out within 24 training sessions, each of which lasted 90 minutes. The program lasted three months, each Monday and Wednesday of the week. The training structure within the three-month work consisted of four parts: an introductory part of 10 minutes (warm-up activities), a preparatory part of 8 to 10 minutes (stretching), the main part of 60 minutes (motor exercises for the development of explosive strength) and the final part 10 minutes (loosening and relaxing). At the beginning of the training work, after the initial diagnosis of motor abilities, procedures were applied to adopt the structure of performing explosive strength motor tasks. Individual exercises consisted of explosively reactive movements for the development of explosive power, such as: jumps (jumps, jumps over the Swedish bench directly and laterally, jumps over the screw, high jumps from squats, etc.); high and small skip, skip in basketball stance; jumps with medical shoes, short passes in pairs, ejections from lying down, from squatting, from basketball stance; a combination of abdominal exercises, push-ups and skips with sprints at 5, 10, 15, 20 and 25 m, etc.; combination of sprints with skip and step in place and movement. The intensity of the load was from 8 to 10 different exercises in 5 series with 3 repetitions in each series with maximum performance speed and using relaxation intervals of 90 to 120 s between series with stretching and relaxation activities.

Statistical analysis

All statistical analyzes were performed using SPSS Statistics 20 software (SPSS Inc., Chicago, IL). In order to obtain basic statistical parameters, the collected data were processed at the level of descriptive statistics, where the number of respondents (N), arithmetic mean (Mean), minimum and maximum score (Min/Max), range (Rang), standard deviation (SD), skewness (Skew) and kurtosis (Kurt). T-test for dependent samples was used to determine the differences between the initial and final measurements.

Results and Discussion

Descriptive statistics of motor abilities

Analyzing the descriptive parameters, we can state that there are no statistically significant deviations from the normal distribution. The values of the standard deviation (SD) show us that the highest homogeneity of the results is for the variable running 20 m with a high start (S20), and the lowest for the variable throwing the medicine ball from the chest from the basketball stance (TMCB). The analysis of the normality of the distribution of results, which was tested by skewness (Skew) and kurtosis (Kurt), shows that there are no statistically significant deviations. Skewness values, which tested the curvature of the curve, show that the variables standing long jump (SLJ) and throwing the medicine ball from the chest from the basketball position (TMCB) have a positive sign, which means that more results are located in the zone of weaker results. For the variable running 20 m from a high start (S20) the sign is negative, which indicates that more results are located in the zone of better results, but since this is about time values, where a worse result is better, we can state that more results of this variable placed in the zone of worse results.

Table 1. *Basic statistics of explosive power variables at the initial measurement*

	N	Mean	Min	Max	Rank	SD	Skew	Kurt
SLJ	12	191	161	248	87	25,733	,941	,834
TMCB	12	584.17	440	739	299	95,602	,167	-,834
S20	12	3.58	3.30	3.84	,54	,171	-,180	-,961

If we observe the normality of the distribution of the results through the value of kurtosis (Kurt), which tells about the analysis of the degree of curvature of the top of the curve, it is noticed that two variables have a negative sign and that they are < 2.75. This tells us that the distribution is platykurtic and that the results tend to be scattered, and the only variable that had a positive sign is the standing long jump (TMCB), that is, it shows that the distribution is leptokurtic, which means that for this variable more results tend to the arithmetic mean.

Table 2. *Basic statistics of explosive power variables at the final measurement*

	N	Mean	Min	Max	Rank	SD	Skew	Kurt
SLJ	12	204.67	171	251	80	25,610	,755	,037
TMCB	12	636	486	795	309	104,219	-,040	-1,307
S20	12	3.52	3.25	3.82	,57	,191	,046	-1,298

Analyzing the descriptive parameters, we can state that there are no statistically significant deviations from the normal distribution. Measures of central tendency show that there was an improvement in results at the final measurement. The values of the range (Rank) of the results indicate that there was a decrease in the SLJ variable, and an increase in the other two variables, which is confirmed by the standard deviation (SD) values, because homogeneity increased in SLJ and decreased in the other two. Analyzing the skewness (Skew) and kurtosis (Kurt), that is, the normality of the distribution of the results, by variables, it can be concluded that they move within the limits of the normal distribution. In Table 2, we note that all the variables, where the skewness was tested for Skew, are within the limits of the normal distribution, with one variable having a negative asymmetry (TMCB), which means that it is a zone of better results, and two variables (SLJ, S20) have positive asymmetry, which tells us that they have a greater number of weaker results. For the variable S20, this represents better values.

Comparing with the results from the initial measurement, it can be concluded that there was a change in the curvature of the curve for two variables. At the variable TMCB in a positive sense, because there are more results in the zone of better results, while with S20 there are more results in the zone of weaker results, which is also good.

If we observe the normality of the distribution of results over Kurt values, it is noted that two variables (TMCB, S20) have a negative sign and are < 2.75. This tells us that the distribution is platykurtic and that the results tend to be fuzzy, and the only variable that had a positive sign is SLJ, that is, it shows that the distribution is leptokurtic, which means that for this variable the results tend to the arithmetic mean. These results indicate that there was no change in the values of the parameters in relation to the initial state.

Comparative statistics of motor abilities - T-test for dependent samples

The results of the T-test shown in Table 3, where comparative statistics were performed on the SLJ variable, indicate that there was a statistically significant difference in the arithmetic means of the samples at the initial and final measurement. The value of T is significantly higher than the tabular value, which also confirms the level of significance obtained (p=.000), which is lower than the level of significance p = .05.

Table 3. *T-test for the standing long jump variable - SLJ*

	Mean	SD	N	Diff.	SD Diff.	T	df	p
SLJ Ini	191.00	25.73						
SLJ Fin	204.67	25.61	12	-13.67	8,886	-5,327	11	,000

The obtained results of the T-test shown in Table 4, where comparative statistics were performed on the variable TMCB, indicate that there was a statistically significant difference in the arithmetic means of the samples at the initial and final measurement. The value of T is significantly higher than the table value, which also confirms the obtained level of significance (p = .006), which is lower than the level of significance p = .05.

Table 4. *T-test for the variable throwing medicine from the chest out of the basket. attitude - TMCB*

	Mean	SD	N	Diff.	SD Diff.	T	df	p
TMCB Ini	584.17	95,602						
TMCB Fin	636.00	104,219	12	-51,833	53,592	-3,350	11	,006

The obtained results of the T-test shown in Table 5, where comparative statistics were performed on the variable S20, indicate that there was a statistically significant difference in the arithmetic means of the samples at the initial and final measurement. The value of T is significantly higher than the tabular value, which also confirms the level of significance obtained (p = .000), which is lower than the level of significance p = .05.

Table 5. *T-test for the variable running 20 meters from a high start - S20*

	Mean	SD	N	Diff.	SD Diff.	T	df	p
S20 Ini	3.58	,171						
S20 Fin	3.52	,191	12	,060	,038	5,450	11	,000

Conclusion

The results obtained and shown in Tables 1 to 5 can usefully help teachers, professors and coaches in the adequate application of the volume and intensity of the exercise, as well as the choice of exercises used for the development of explosive strength.

From the theoretical aspect, the importance of this work is in increasing the level of professional knowledge about the structure of the results of motor tests, the long jump from the standing position, throwing the medicine ball from the chest from the basketball stance and running 20 m from a high start.

From a practical aspect, the obtained results can represent the basis for a more correct approach to planning, programming, implementation and control of work in physical education classes and the training process in the sports selection of various sports branches.,m which gives this work a useful value.

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