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WAYS TO DEVELOP RESISTANCE THROUGH SPECIFIC MEANS OF ATHLETICS IN FOOTBALL JUNIORS

Monea Dan (a), GrosuVladTeodor (b), Grosu Emilia Florina (c)*, Popovici Cornelia (c)
*Corresponding author

(a) Faculty of Physical Education and Sport, "Babeș- Bolyai" University, M. Kogălniceanu street, no 1,Cluj-Napoca, Romania, moneadan@yahoo.com, emiliaflorina.grosu@gmail.com
(b) Technic University, Mechanic Faculty,Muncii Street, no.103 -105, Cluj-Napoca, Romania, vtgrosu@gmail.com
(c) University of Medicine and Pharmacy "IuliuHatieganu", Faculty of Medicine, Pasteur street, no.6, Cluj-Napoca, Romania, popovicicornelia@yahoo.com

Abstract

The aim of this study is to provide a broader dimension to the physical training component by deepening the methodology of developing the resistance strength of 15-16 year old junior football players to achieve maximum performance. Assessing the level of biological and motor development (in terms of resistance), selecting, organizing and targeting the specific means of athletics, in order to improve the resistance in athletes. Hypothesis: Following the application of the interview program, we have obtained an improvement in the level of the manifestation of the motor skills and particularly the level of the resistance. The operational systems used will achieve favourable biological, psychological effects on athletes. Methods: We have used The Luc Leger test, which investigates the cardio-respiratory resistance and the Cooper test that evaluates on-site the exercise capacity, aerobic resistance (continuous run for 12 minutes). Findings and Results: The VO2 max indicator estimated to be consumed during the running on the treadmills has favourably evolved, meaning that the values have increased significantly. We appreciate that the aerobic resistance of the studied subjects and the effect of the intervention program. Conclusions: Adapting the method to the specificity of the football game is achieved by obeying the following requirements: the content of the activity should include specific means and methods; engaging anaerobic lactacid efforts; lengths and distances to be repeated in an ever-varying quantity; and in active pauses to use technical means, with less effort.

Keywords: Resistance, juniors, football, cardiac rhythm, sport performance, exercise.

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1. Introduction

The general physical capacity is at the basis of sports training aiming to achieve a harmoniously developed organism that will ensure the improvement of sports performance, (Grosu, 2009). This component ensures the highlighting of the technical and tactical luggage specific to the football game as well as the functional and morphological indicators that will improve the quality of motric qualities.

2. Problem Statement

The general objectives of the research are: to evaluate the level of biological, motoric development (from the resistance point of view); to select, order and justify the specific means of athletics, for their use in the experimental approach; verifying the effectiveness of the intervention system to improve resistance in football players subject to experimental research, in the light of the results of the tests, testing and competitions, (Grosu, Grosu, & Monea, 2015).

The experimental research was carried out on a group of 23 subjects representing the components of the 15-16 year old junior football team from the "F.C. University "Cluj-Napoca, trainer Sima Daniel, which agreed to our conception about planning and programming to improve the resistance. We have chosen this group of age because we appreciate that the physical training must be assessed and considered as important as the technical- tactical training (Grosu, Popovici, & Mihaiu, 2010).

3. Research Questions

Following the application of the interview program, we have formulated these hypotheses: if, in the systematic training of junior football players (15-16 years old) there is an intervention with specific means of athletics, the improvement of the motoric qualities level is obtained, which induces positive effects in the physical training plan; if we operate with specific means, selected form athletics according to the age (15-16 years) and their background the level of resistance of these athletes is improved; if in the training of junior football players, we use operational systems from the running school and athletic tests, targeted and precisely directed, biological, psychological and resistance effects are obtained in combination with the other motoric qualities.

4. Purpose of the Study

The aim of this study is to provide a broader dimension of the component - physical training, by deepening the approach of the methodology of developing the resistance of football players - juniors aged 15-16 years, in order to achieve the maximum performance capacity. (Motroc & Motroc, 1996; Neța & Popovici, 2005; Miu &Velea, 2002; Rădulescu & Cojocaru, 2003).

4.1. Organizing and conducting the research

Experimental research was conducted between 25 October 2017 and 30 June 2018 having the following structure: Initial testing (T1) "block test" 25-29 October 2017; Intermediate Testing (T2) "Block Test" 14-20 February 2018; Final Testing (T3) "Fractional Testing" May 2, May 9, May 16, June 20-23, 2018 included, biomotric and personality investigations of the subjects.

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As the championship edition 2017 - 2018 took place in an unprecedented way, round-the-clock, without pause, the competitive period lasted, from March 28 to June 30, 2018. In this situation we specify that initial testing, as well as the intermediate testing were carried out "in block" and in the above-mentioned periods respectively; due to the "block" competition system, the final testing was performed, immediately after the tour, as follows: May 2, May 9, May 16, general resistance and resistance tests involving speed, 20-23 June biological samples and power-strength tests. The biological investigations were carried out under the direct assistance of Dr.PătacAriana, at Sports Clinic of Cluj-Napoca.

4.2. Statistical indicators

Descriptive statistics elements were calculated; data presented by using centrality, location and distribution indicators. Statistical processing was performed with the Excel application (from the 2007 Microsoft Office), and the graphical representation of the results was done with the Excel application.

5. Research Methods

The onset of the scientific approach we have made was the bibliographic documentation, studying and selecting specialized sources, internal and external, which provided us with important information.

5.1. The resistance shuttle – Luc Leger Test

The Resistance Shuttle (Luc Leger test) investigates cardio-respiratory resistance by running an accelerated pace at a distance of 20 meters, changing the direction and pace using a beep, the frequency of which progressively increases at each minute (recording it in number of steps - or minutes); the test is conducted by a tape recorder. After every minute, the time interval between the signals decreases, so the speed increases (Table 1). The first speed is considered to be level 1, second one level 2 and so one... Each ladder takes about 1 minute, and the test has 23 minutes. Every subject has to run as long as possible until he cannot get in the speed of the tape, at which point he must withdraw from the test. (Gindre, Lussiana, Hebert-Losier, & Morin, 2016).

5.2. The Cooper Test

The Cooper test evaluates the aerobic resistance of the subjects and takes the form of a continuous run for 12 minutes

5.3. The intervention program consisted of:

- The resistance shuttle in ascending steps is a fast, reverse-shift movement in which the displacement segments are: 5 m (reverse), 10 m (round-trip), 15 m (reverse), 20 m (two way); the distances traveled with speed, stops, change of direction totals 100 m and assess the resistance in speed mode. (Monea, Grosu, Grosu, & Nica-Badea, 2016). We recorded the running time in seconds.
- Sit-ups that assess local resistance in abdominal muscles. The subject lays down on the back, knee-bent assisted by the partner, hands on the head, performs a maximum number of reps, reaching the knees in 60 seconds; the measurement was performed by recording the number of repetitions.

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▪ Successive jumping and landing on both legs, for assessing local lower limb resistance, McIntyre, Mawston, and Cairns, (2012). The subject performs 10 successive detachments on both legs as long as possible (in height) the measurement shows the number of meters (and centimeters) jumped, Juarez, Lopez de Subijana, Mallo, & Navarro (2011).

▪ The specific test evaluates the (special) ability to run and lead a ball for 6 minutes, (Latorre-Román, García-Pinillos, Martínez-López, & Soto-Hermoso, 2014). Each subject with a ball; he starts from the corner of the field with the ball on his leg, crossing the length and width, and from the opposite angle, passes diagonally to the field, to the coach or a player, who is near the starting point. After the pass, the subject crosses the other length and width of the field, picks up the ball and leaves for the next run, continuing until the 6 minutes expires. The measurements were made in meters during those 6 minutes.

6. Findings

By using this tool, we have succeeded in improving the overall resistance of athletes, optimizing the motoric performance of the athletes involved in the experiment. Table 01 presents the values of these improvements.

Table 01. Fractionated times on levels in the resistance shuttle

Nr. Crt.	Speed km/h	Level time (seconds)
1	8	9.00
2	9	8.00
3	9.5	7.57
4	10	7.20
5	10.5	6.85
6	11	6.51
7	11.5	6.26
8	12	6.00
9	12.5	5.76
10	13	5.53
11	13.5	5.33
12	14	5.11
13	14.5	4.96
14	15	4.80
15	15.5	4.60
16	16	4.50
17	16.5	4.26
18	17	4.23
19	17.5	4.11
20	18	4.00
21	18.5	3.82
22	19	3.62
23	19.5	3.52

The results of the Cooper test can be consulted in Table no. 02.

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Table 02. Cooper test

Age	Excellent	Above average	Average	Under average	Weak
15-16	>2800	2800-2500m	2499-2300m	2299-2200m	<2200m

Table 03. Statistical indicators in initial testing (T1), intermediate testing (T2) and final testing (T3) for the Resistance Shuttle test (minute/steps)

Statistical indicators	Values (VO2 max) T1	Values (VO2 max) T2	Values (VO2 max) T3
Arithmetic mean	8,43	9,83	11,09
Standard error	0,30	0,34	0,34
Median	9,00	10	11
Module	9,00	10	12
Standard deviation	1,44	1,61	1,65
Dispersion	2,08	2,60	2,72
Aplatization	-1,04	-0,84	-1,12
Asymmetry	0,14	0,17	0,25
Amplitude	5	6	5
Minim	6	7	9
Maxim	11	13	14
Sum of results	194	226	255
Number of subjects	23	23	23

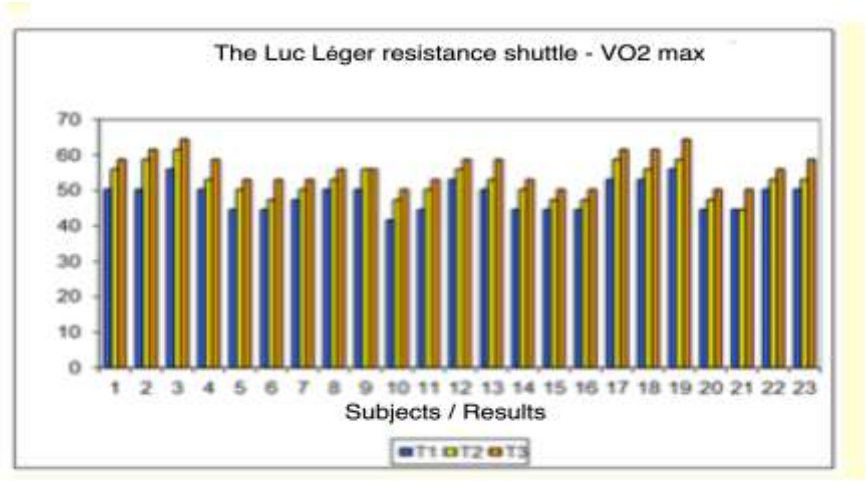

Figure 01. The individual centralized values for the 3 testing's in the resistance shuttle

The aerobic resistance investigated by the Luc Léger resistance shuttle, evaluates the number of levels (minutes) in running and VO2 max consumed. The performance dynamics of the number of levels can be described by the following statistical parameters, as seen in Table no. 3 and Figure no 1:

- the arithmetic means of the levels, minutes spent in the initial test are 8.43 with an intermediate mean value of 9.83 and a mean of 11.09 in the final testing;

- median and module have the same value, 9 for initial testing and 10 for intermediate testing; in the final test, the value that divides the series into two equal halves is 11 and the central value or the module is 12;

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- the standard deviation is 1.44 in the initial testing to increase sensitively in the intermediate testing at 1.61 and 1.65 respectively in the final testing;

- the amplitude of the individual value range is 5 at the initial testing, increasing to 6 in intermediate testing and 5 in final testing.

Table 04. Statistical indicators in initial testing (T1), intermediate testing (T2) and final testing (T3) for the Luc Leger resistance shuttle (VO2max)

Statistical indicators	Values (ml /kg/min) T1	Values (ml /kg/min) T2	Values (ml /kg/min) T3
Arithmetic mean	48.68	52.62	56.21
Standard error	0.86	0.95	0.98
Median	50.3	53.1	56
Module	50.3	53.1	58.8
Standard deviation	4.10	4.59	4.68
Dispersion	16.83	21.09	21.88
Aplatization	-1.02	-0.85	-1.11
Asymmetry	0.14	0.15	0.25
Amplitude	14.3	17	14.2
Minim	41.7	44.6	50.3
Maxim	56	61.6	64.5
Sum of results	1119.6	1210.3	1292.8
Number of subjects	23	23	23

The analysis of VO2 max showed a favorable evolution, an increase in values from the initial testing to the final testing. We consider that the aerobe resistance has improved in our subjects also by using our intervention program. Arithmetic mean increased from 48.68 in the first testing to 56.21 on the final testing. Standard deviation with the value of 4.10 in the first testing ends up with the value of 4.68 in the final testing. The standard error increased from the value of 0.86 in the first testing to the value of 0.98 in the final testing. Median value increased from the value of 50.3 in the first testing to the value of 56 in the final testing, as seen in Table no 4.

There are many phases in the football game, which are carried out with a speed-resistance effort, as evidenced by the accumulation of lactic acid in the amount of 12-15 mmol/liter (Bompa, 2003). So, the soccer player needs a good anaerobic capacity on the background of aerobic endurance. In the football game, there are frequent cyclical executions, which require a good speed resistance, which needs to be developed by short intervals training in high-speed actions.

Table 05. Ratings-based on the number of subjects and percentages in the resistance shuttle for the 3 testings

Ratings	Excellent		Very good		Good		Medium		Satisfactory	
	Nr of subjects	%	Nr of subjects	%	Nr of subjects	%	Nr of subjects	%	Nr of subjects	%
T1	-	-	-	-	**5**	**21.73**	**9**	**39.13**	9	39.13
T2	-	-	**1**	**4.34**	12		9	39.13	1	4.34
T3	**2**	**8.69**	**3**	**13.04**	**13**	**56.52**	5	21.73	-	-

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In the initial testing 5 subjects (21,73%) were ranked with" good", 9 subjects (39,13%) with medium and satisfactory. In the intermediate testing we underline that 1 subject (4,34%) was ranked with very good, 12 with good and 9 with medium and 1 with satisfactory. In the final testing 2 subjects were ranked excellent, 3 very good, 13 subjects (56,52%) with good, 5 subjects with medium, none with satisfactory. For detailed results please consult Table 5 and Table 6. In figure no 2 you can see the individually centralized results in the resistance shuttle in ascending steps, all 3-testing included.

Table 06. Statistical indicators for the resistance shuttle in ascending steps

Statistical indicators	Values (ml /kg/min) T1	Values (ml /kg/min) T2	Values (ml /kg/min) T3
Arithmetic mean	25.49	24.28	23.604
Standard error	0.24	0.26	0.251
Median	25.50	24.30	23.700
Module	26.00	25.10	23.800
Standard deviation	1.17	1.24	1.206
Dispersion	1.36	1.54	1.454
Aplatization	-0.51	-0.23	-0.492
Asymmetry	0.18	0.19	-0.004
Amplitude	4.4	4.8	4.5
Minim	23.6	22.2	21.4
Maxim	28	27	25.9
Sum of results	586.3	558.5	542.9
Number of subjects	23	23	23

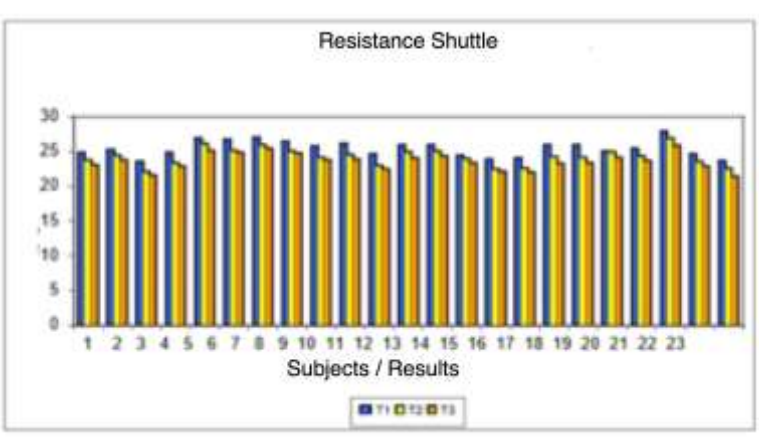

Figure 02. The individual centralized values for the 3 testing's in the resistance shuttle in ascending steps

Anaerobic capacity to support oxygen demand increases in the puberty and reaches peak values at 18-20 years, while the aerobic capacity reaches 80% of the maximum at 16 years of age. A valuable indicator used by coaches in choosing distances and working tempo to provoke anaerobic, mixed aerobic effort is cardiac frequency. When the heart rate exceeds 180 beats/minute, the effort is predominantly anaerobic. The reaction of the main systems and functions involved in this effort is very strong. The maximum blood pressure is over 180mmHg, reaching even 240mmHg, pulmonary ventilation records 120-140 l/minute, and oxygen consumption can exceed 5-6 l/minute.

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After reaching VO2max, the effort is carried out in oxygen deed, which causes the accumulation of lactic acid in the blood, which is a limiting factor of effort. For anaerobic efforts, the lactic acid concentration is between 1-24 mm/l. The characteristic of this effort is that it influences both strength and speed. The degree of influence on resistance is directly proportional to the workload, (Weineck, 1990, 1994).

7. Conclusion

The cruise speed indicator provided by the "resistance shuttle in ascending steps" test reveals a progress of the subjects studied at each test. The comparison between initial and final testing indicates a significant difference (statistically), which can be explained by our experimental intervention in improving the speed resistance of football players for 15-16 years.

Adapting the method to the specificity of the football game is achieved by obeying the following requirements: the content of the activity should include specific (technical-tactical training) means and methods; engaging anaerobic lactacid efforts (submaximal and maximal efforts); lengths and distances to be repeated in an ever-varying quantity; and in active pauses to use technical means, with less effort.

At this age, the football game requires the locomotor system, the central nervous system and the cardiovascular system. The players are able to adapt with great efficiency to these modifications, and to the requirements of the modern game, aiming to increase the overall biological potential and the effort capacity. The cardiovascular system is involved by supplying oxygen to the muscles and other systems involved in the effort. There is an increase in cardiac and arterial blood pressure of the players (except at gatekeepers) and an increase in cardiac output, (Wilson et al., 2013).

In order to achieve a good training, the football player must support a job-specific training by emphasizing the execution of the technical elements and procedures at maximum speed, increasing the number of repetitions or the execution distance.

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Author’s contributions: contributed to the writing of this paper. All of the authors read and approved the final version of the manuscript

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