The role of a training program based on fitness and athletics, to improve the cardiorespiratory fitness and agility to young basketball players during a 6 – month period

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Abstract

The purpose of this research paper is to highlight the improved performance cardiorespiratory fitness and velocity at the young basketball players during a fitness and athletic program for a 6 month period, without changing the frequency and volume of the number of training sessions. This study involved 48 basketball players, part of the youth teams, regular participants in the national championship, where 25 of them were used for case study (intervention group) and 23 other as a control case (control group). The program proposed by this study consists in training with two training sessions (40 min) per week within technical tactical training sessions with a duration of 120 minutes (a- athletic program based on speed and coordination training with a duration of 10 minutes, b- fitness program based on force training with a duration of 30 minutes). Measurements were taken before and after the program in these qualities: aerobic capacity (*Ergometric bicycles*): maximal absolute oxygen consumption (l/min) and relative oxygen consumption (ml/kg/min), speed (straight running test - 10 and 20m), as well as coordination/agility (10 x 5m). ANOVA test (one way) followed by the detailed test LSD (post hoc) was used to compare the results of the difference between the control and intervention group in measurements before and after the intervention. The findings of our study support previous research and provide improvements in these variables: aerobic capacity, speed, coordination/ agility. Through our program which combined agility, fitness and athletic training, was made possible to register improvements in cardiorespiratory fitness and speed, as was measured with 2 tests before and post the program intervention.

Keywords: basketball, cardiorespiratory fitness, youth, strength, agility

Introduction

The main forms of motors skills, represented by *sustainability, strength, speed, articular movement and coordination skills*, constitute the basic premise for the acquisition and implementation of motor movements, physical-sportive ones. In a more simplified schematic, they can be grouped into physical skills and coordinative skills. While the physical skills are based mainly on energy processes, those coordinative ones are based on the central nervous processes of organization and control. But we must clarify in advance that such a classification is done just to simplify the argument. None of the skills are absolutely part of only one of these processes; in the best case, we could distinguish only a predominance of one process to another. Even the concept of physical form, is not excluded from the lack of accuracy in the case that would restrict only in terms of its formulation. In the specialized literature, according to the view of treatment, the concept of physical form is defined and interpreted in different ways (Martin 1977; Albrecht 1982; Bisanz 1983, Gerisch 1983; Bauer, Ueberle 1984; Dick in 1986, Binz, Wenzel 1987; Schnabel 1987; Bisanz, Gerisch 1988, 1990; Stiehler, Konzag, Dobler 1988; Bauer 1990; Geese 1990). The level of jumps for both groups was approximately 70 units, the number of shoots in the basket was approximately 17 (Konzag 1965 and continues to Hagedorn et al. 1985). The playmaker and the forward typically represent a lower stature than post players, and for this reason, they must possess excellent qualities in speed, movement and resistance in order to create advantages in the game. This means that resistant defenders also need a high level of maximum strength and speed strength, in order to be superior to their

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opponents for rebounding and basket defence and can also respond to the rapid changes of direction by opposing players.

Methods

The objectives of this study were: measuring the parameters of physical qualities such as maximum absolute/relative consumption of oxygen, speed and coordination (dexterity), before and at the end of the study (break in program). The hypothesis of this study were: with the introduction of fitness-athletic program (6 months) to physical preparation of young basketball players, we hypotheses that there will be an improvement in all physical-functional parameters (physical attributes) tested in this study.
In this study will not change the current model of the duration and frequency of the number of training sessions (to youth teams in basketball) with the only reason that every improvement of any variable tested in this study to be not dedicated to the increasing of number sessions as well as its duration. This study involved 48 players, basketball players in the youth teams, regular participants in the national championship, with a basketball experience of 3-4 years. In this study participated 25 athletes who were used for the case study (break in group) and 23 other athletes as a control case (control group). In this study the young (players) were divided into two groups; - intervention group were was developed the proposed program, - and the control group, where they continued their normal program (training of physical qualities in the basketball court) and were carried out only tests (before and at the end of athletic fitness program).

Protocol testing
Objective
Maximum oxygen consumption (aerobic capacity - Ergometric bicycle)
Procedure
Astrand – Ryhming in cycle-ergometer
Protocol has registered 9 loads.
Men loads 300kpm / min (50W) - 1500 kpm / min (250W) with gradual increase 25 W.
Women loads 300 kpm / min (50W) - 900 kpm / min (150W) with gradual increase 12.5 W.
During the first and the second minute, the load is gradually increased by the supervisor until the cardiac frequency to be above 120 beats/min and not vary more than 4 beats/min within 30 sec. Next, the load will be automatically increased by the program itself.
If the cardiac frequency at the end of the sixth minute do not vary more than 4 beats/min from Cf at the end of the fifth minute and if the cardiac frequency during the interval between 5th - 6th minutes ranges from 130 to 170 beats/min, the test ends after 6 minutes.
If the cardiac frequency at the end of 6th minutes is less than 130 beats/min, the load increases from 50 to 100 Watt and test continues for other 6 minutes.
If the cardiac frequency at the end of minute 6 varies by more than 4 beats/min within 30 seconds, test continues with the same load in order to achieve stable cardiac frequency.
VO2max provided depending on the workload and heart rate is multiplied next to the correlation factor for age and correlation factor for maximum cardiac frequency. Correlation factors are presented in the following table.

Speed

Objective
Speed (10 and 20m)
The purpose of this test is to determine the maximum speed of the players in sprint and acceleration capability from the static position.
Procedure
The device with which the measurements are performed: BROWER Timing System, constitute a system of equipments for perfect and uncontested measurements.
Subjects which will be tested should have done warm -up before conducting the test. It is highly recommended that any subject to perform a sub maximal running for at least 10 min, followed with a long stretching to be ready for the test. For this test, measuring units that make up the gates were at the level of the hips of the subject, where the infra red rays intersect. Gates placed 10 and 20 meters away from each other, where the start of the subject is 30 cm above the first opening gate. Subject starts from the starting point set without command when he feels comfortable to start running, and ends at the second exit gate set 10 and 20 meters away from start. Each subject performs the test twice, with 5 minutes apart from the first one, from which is selected and obtained the best time.

Coordination/ Agility
Objective
Coordination (agility) measurement, (10 x 5m).
Shuttle run Test, 10 x 5 metres (Eurofit., 1993), is carried out to evaluate the speed and coordination of

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the lower limbs.
Procedure
Target cones/ or orientation lines, placed five meters away. Subject prepares for testing, setting foot on the starting line. Subject starts when he is ready, and runs towards the distance border. This action is repeated five times without stopping (covering a total distance of 50 meters). Every orientation lines should be fully passed with both feet. Testing time recorded. For this testing, are required these devices: Starters (electronic system, ***Brower***), adhesive marker, and a suitable ground, flat and not slide.
The program proposed by this study consists in training with two training sessions (40 min) per week within technical and tactical training sessions with duration of 120 minutes;
a- athletic program based on speed and coordination training with duration of 10 min,
b- fitness program based on strength/force training with a duration of 30 min.

Statistical analysis
To perform the statistical analysis, it is established a special data on the Excel program (tests before and after intervention). Later this database is converted to database SPSS (statistical program). The differences in basic variables between the control and the break in group were determined by student test (t test). All variables assessed in this study were tested for normality. ANOVA test (one way) followed by LSD test (post hoc) was used to compare the results of the difference between the control and the break in group measurements before and after the intervention.

Results

Table 1 gives descriptive data for participants in this study. The average age was 17.2 years old (standard deviation 0.6, the minimum value 16.9 and maximum value 17.8 years old). The average weight of athletes is 72.5 kilograms (standard deviation 8.0, minimum value 60 kg, the maximum value 84 kg). Height of participants in average value is 1.79 meters (standard deviation 0.05: minimum value 1.71 meters and maximum value 1.86 meters). Body mass index was 22.5 kg/m2 (standard deviation 1.6, minimum value 19.9 kg/m2 and maximum value 24.4 kg/m2).
Table 2 presents the statistical comparison from the first measurement to the second one of the control group. Intervention and control*intervention, in aerobic capacity (VO2 Max):
a)In aerobic capacity (VO2 Max) (L min) change in the control group is (F = 24.77; sig. = 0.04), in the intervention group (F = 19.37, sig. = 0.05) and control*intervention (F = 28.00; sig. = 0.03).

b) In aerobic capacity (VO2 Max) (ml/kg/min) change in the control group is (F = 6.98, sig. = 0.12), in the intervention group (F = 5.03; sig. = 0.15) and in control*intervention (F = 4.56; sig. = 0.17).

Table 1 Descriptive statistics for the participants in the study

	N	Min	Max	Mean	Devi Stand
Age	48	16.9	17.5	17.2	0.6
Body Mass	48	60.0	84.0	72.5	8.0
Body Height	48	1.71	1.86	1.79	0.05
BMI	48	19.9	24.4	22.5	1.6

Table 2 The comparison between the control and the intervention group in VO2 Max.

	Source	Type III Sof S	Mean Square	F	Sig.
Vo2 Max (L/min)	Control	0.08	0.08	24.77	0.04
	Intervention	0.24	0.24	19.37	0.05
	Control * Intervention	**0.24**	**0.24**	**28.00**	**0.03**
Vo2 Max (ml/ kg/ min)	Control	8.84	8.84	6.98	0.12
	Intervention	21.07	21.07	5.03	0.15
	Control * Intervention	**28.83**	**28.83**	**4.56**	**0.17**

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Table 3 presents statistical comparison from the first measurement to the second one of the control group. Intervention and control*intervention sprint, agility and coordination:

a) In sprint (10 meters) the change in the control group is (F = 3.86, sig. = 0.11), in the intervention group (F = 20.83; sig. = 0.01) and control*intervention (F = 6.45; sig. = 0.05).

b) In sprint (20 meters) the change in the control group is (F = 0.02, sig. = 0.89), in the intervention group (F = 58.99; sig. = 0.00) and in control*intervention (F = 4.46, sig. = 0.05).

c) In agility and coordination the change in the control group is (F = 5.99, sig. = 0.06), in the intervention group (F = 36.54; sig. = 0.00) and in control *intervention (F = 7.64, sig. = 0.04).

Table 3 The comparison between the control and the intervention group in sprint and agility

	Source	Type III Sum of Squares	Mean Square	F	Sig.
Sprint (10m)	Control	0.00	0.00	3.86	0.11
	Intervention	0.02	0.02	20.83	0.01
	Control * Intervention	**0.01**	**0.01**	**6.45**	**0.05**
Sprint (20m)	Control	0.00	0.00	0.02	0.89
	Intervention	0.13	0.13	58.99	0.00
	Control * Intervention	**0.07**	**0.07**	**4.46**	**0.05**
Agility (10x 5m)	Control	0.09	0.09	5.99	0.06
	Intervention	0.89	0.89	36.54	0.00
	Control * Intervention	**0.35**	**0.35**	**7.64**	**0.04**

Conclusions

Through our program which combined agility, fitness and athletic training, was made possible to register improvements in physic-functional parameters, as was measured with 2 tests before and post the program intervention. The evidence of these improvements through participation in the training program can increase the compatibility of athletes, which can give them benefits of these programs such as how to prevent injuries. Furthermore, the component of functional strengthening in our program and should be added to the ball stability exercises, which have provided evidence of an improvement in static equilibrium in the study of Cosio-Lima et al., (2003). Future research should be directed to the study of equilibrium and other tasks to increase the performance of athletes from different sports, using a randomized controlled projection to improve the generality of the findings. The studies should also examine the role of a program maintenance (on season) during the season, as well as to maintain the increase of equilibrium after the training and throughout the season.

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