Sports University of Tirana
Faculty of Movement Sciences

DISERTATION

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

FIELD OF STUDY

Sport Physiology

Student: Msc Andi Spahi (Kand. Dr)

Supervizor: Prof. Asc. Dr Juel Jarani (PhD)

Tirana 2016

Abstract

Purpose

The purpose of this research paper is to highlight the improved performance of physic-functional parameters (physical attributes) 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.

Methodology

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: the strength of the lower limbs (in isokinetic dynamometer *Easytech*), in *isometry* (10 seconds), and *isokinetic* (5 repetitions) regimes, in flexion and extension, the speed of response (*in force platform Leonardo Mechanography Drop jump test DJ*), 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).

All variables assessed in this study were tested for normality. 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 level $p < 0.05$ (significant difference) was admitted to this study. All statistical analyzes were performed using SPSS 20.0 software.

Result

From this study we can emphasize the confirmation of the hypothesis of improvements in physic-functional parameters in young basketball players, which are clearly shown in the statistical analysis at the results section. Improvement in these parameters by means of this program, intends to emphasize more and more the improved system of motor skills and the increasing challenges of neuromuscular control at the young basketball players as a necessity in achieving maximum performance in this game. The findings of our study support previous research and provide improvements in these variables: isokinetic and isometric strength, aerobic capacity, speed, coordination/ agility.

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 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.

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). In an extended conception of the argument, the term condition is used as a form of summary of all the psychic, physical, technical-tactic, professional and social factors of the appearance, within the meaning of the Latin word ***conditio*** (= conditions, the ability to accomplish something) (Bauer 1990). It is presented in a schematic form of an expanded concept (specifically in the case of condition of a basketball player). This concept, in a more simplified form - and that is exactly what is used in the practice of sport and exercise - as we mentioned, is limited to factors largely "physical", such as sustainability, strength, speed and articular movement. Konzag et al (1965) have studied the game and practice results of the post and forward players. The subject of their study has been only the man and women players of the highest level. In it, it is presented a summary of the obtained results (on average values). It shows that a player during a game runs a median distance of 3 - 3.5km, most of which without the ball. For the forwards, the total distance completed with a ball was 174m, much higher than the post players with 69m. Even the number of contacts with the ball, that the two groups performed moving rapidly, was twice higher for the forward players comparing to those of post players (33.9 forward, 14.5 post). 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. Players, who usually play near the basket, need not only a high strength in jumping, but also a considerable strength of the trunk, to dominate the fight for the ball down the basket (Brown et al. 1995). In the basketball game, the physical factors such as general and special resistance, the muscular strength, speed and movement, are never apart as separate elements. This means that resistant defenders also need a high level of maximum strength and speed strength, in order to be superior to their opponents for rebounding and basket defence and can also respond to the rapid changes of direction by opposing players.

Methodology

Purpose

The purpose of this research paper is to highlight the improved performance of physic-functional parameters (physical attributes) of basketball young players during a fitness and athletic program for a period of 6 months without changing the frequency and volume of the number of training sessions.

Objectives

1. Measuring the parameters of physical qualities: strength of the lower limbs in the isometry and isokinetic regimes, speed of reaction, jumping, maximum absolute/relative consumption of oxygen, speed and coordination (dexterity), before and at the end of the study (break in program).

2. Develop a fitness program (strength) and athletic (speed/coordination) for a period of 6 months.

3. The statistical comparison of data obtained from the tests before and after the break in program (parameters of physical attributes) with the aim to validate the effectiveness of the program in improving these physical parameters.

Hypothesis

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.

Methods

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). These players (from the city of Tirana teams) were selected randomly from a group of 8 teams that regularly participate in the national championship.

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.

In this study the young (players) were divided into two groups;

- the break in 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).

Measurements were taken before and after the program as follows:

1. The strength of the lower limbs (in dynamometric isokinetic ***EasYtech***) in isometry regimes (10 seconds), and isokinetic (5 times) in flexion and extension
2. Speed of reaction (in force platform *Leonardo Mechanography*, ***Drop jump DJ*** test)
3. Maximum absolute oxygen consumption (l/min) and relative oxygen consumption (ml/kg/min); aerobic capacity - ***Ergometric*** bicycle)
4. Speed (straight running test- 10 and 20m)
5. Coordination / dexterity (10x5 m).

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). Descriptive statistics (averages, standard deviations, minimum and maximum values) for measurements before and after the intervention were calculated for variables assessed in this study (all tests performed in this study). 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. The level $p < 0.05$ (significant difference) was admitted to this study. All statistical analyzes were performed using SPSS 20.0 software.

Protocol testing

Strength of the lower limbs in isometry and isokinetic

Objective

Isokinetic Dynamometer is used in rehabilitation programs, based on the dynamic (isokinetic, hydrodynamics, isotonic exercises), or static actions (isometry), an active and therapeutic medical device of Ist Class. However, the equipments should be used under the direct supervision of a medical specialist. In measuring the strength of the lower limbs was used isokinetic dynonamometer ***"EasYtech"***. Isometric strength was measured during 10 seconds and isokinetic one over 5 repetitions, for both left and right leg (in flexion and extension).

The procedure

The exercised articulations are:

Knee

Closed kinetic chain (hips - knee - ankle)

Types of movement are:

Isokinetic: The system "answers" (reacts) to the movements of the subject and keeps unchanged the fixed *angular speed*.

Isometric: the system *is locked in a static way in determined angles*, and the strength aplied by the subject is registered.

In any case, it will be induced (caused) a type of **passive** reaction, thus a deterrent effect, which would never act on the subject with a greater force than that produced by the subject itself.

The exercised articulations are:

- ***Ankle***
- ***Knee***
- ***Shoulder***
- ***Closed kinetic chain (hips - knee - ankle)***

Speed of reaction

<u>Objective</u>

speed of reaction (*Leonardo Mechanography* strength platform **- *Drop Jump, DJ*** test)

<u>The procedure</u>

DJ (Drop Jump) Test on the Contact time with the ground. Jump to the platform from a certain height (approximately 20, 40, 60, 80 and 100 cm), and in the moment of the contact we try to react as quickly as we can to jump as high as possible. This Test is for sports subjects. The time of contact with the platform should as short as it can. It expresses also coordination of internal and external muscle.

Type: test of time/speed of contact with the ground.

Movement: release to the platform from a determined height (chair), and try to jump as quickly and as high as possible. This test is quite common in sports where the most important parameter is the combination of the time of contact with the ground and the air time (the smaller the contact time, the better it is).

The field of application: This test is applied mainly for athletes.

Objectives/results: Evaluation of speed: evaluation of internal and external muscle coordination.

The parameters obtained from the test: Force, acceleration, strength, kinetic energy, potential energy, weight, time of contact with the ground, changes L/R (Left/Right).

Maximum absolute and relative oxygen consumption (aerobic endurance)

Objective

Maximum oxygen consumption (aerobic capacity - Ergometric bicycle)

YMCA in cycle ergo meter consists of three stages lasting 3 minutes each, thus 9 minutes in total. Practice Test terminated after 6 minutes if the cardiac frequency during the first stage reaches over 100 beats/min. If the cardiac frequency at the end of 6 minutes is less than or equal to 100 beats/min begins the third stage. Practice Test ends after 9 minutes, or earlier if the cardiac frequency reached a value as 85% maximum heart rate (220 - age in years) or as 70% heart rate reserve (Cfmax - Cf rest)

In the final test report it is presented the VO2 max as well as the max loading if in the computer is installed the appropriate software but in case of anomalies of the program the VO_2 max value we can calculate with the following formulas:

Equation Whipp & Wasserman: $VO_{2max} = (10,3 \text{ x } W_{max}) + (5,8 \text{ x PT}) + 151$

W_{max} – load in Watt (1 kgm/min = 1 Watt / 6)

PT – Body Mass in kg

Equation American College of Sports Medicine: $VO_{2max} = (2 \text{ x } W_{max}) + (3,5 \text{ x PT})$

W_{max} – load in Watt (1 kgm/min = 1 Watt /6)

PT – Body Mass in kg

In the final test report is presented the VO2 max expressed in ml/kg/min & liter/min, maximum loading expressed in Watts and interpretation of VO2max depending on age, gender, body weight and height.

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 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.

Results

Table 1 gives descriptive data for participants in this study, in which participated 48 young basketball players divided into two groups (n = 23 control group into two teams and N = 25 intervention group into two teams). The players regularly participate in the youth national basketboll championship. These four teams were selected randomly from a database which consisted of 12 teams. 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 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 presents the statistical comparison from the first measurement to the second one of the control group. Intervention and control*internevention in isometry. a) In left isometry max strain muscle in rotation change in the control group is (F = 26.3; sig. = 0.00), in the intervention group (F = 24.00; sig. = 0.00) and in control * intervention (F = 45.0; sig. = 0.00).

b) In right isometry the max strain muscle in rotation change in the control group is (F = 1.303, sig. = 0.31), in the intervention group (F = 11.289; sig. = 0.02) and in control * intervention (F = 13.393; sig. = 0.02).

c) In the left isometry the average of twisting change in the control group it is (F = 8.261, sig. = 0.04), in the intervention group (F = 10.996; sig. = 0.02) and in control * intervention (F = 6.943; sig. = 0.05).

d) In the right isometry average strain muscle in rotation change in the control group is (F = 9.738, sig. = 0.03), in the intervention group (F = 38.44; sig. = 0.00) and in control * intervention (F = 14.14, sig. = 0.01).

Table 2 The comparison between the control and the intervention group in the isokinetic force for the right and left (extension and flexion).

	Source	Type III Sum of Squares	Mean Square	F	Sig.
Izometri (Left) Max Torque	Control	20.167	20.167	26.304	0.00
	Intervention	24.000	24.000	24.000	0.00
	Control * Intervention	**54.000**	**54.000**	**45.000**	**0.00**
Izometri (Right) Max Torque	Control	2.042	2.042	1.303	0.31

	Intervention	12.042	12.042	11.289	0.02
	Control * Intervention	**37.500**	**37.500**	**13.393**	**0.02**
Izometri (Left) Avg Torque	Control	8.760	8.760	8.261	0.04
	Intervention	12.760	12.760	10.996	0.02
	Control * Intervention	**30.375**	**30.375**	**6.943**	**0.05**
Izometri (Right) Avg Torque	Control	12.760	12.760	9.738	0.03
	Intervention	10.010	10.010	38.44	0.00
	Control * Intervention	**26.042**	**26.042**	**14.14**	**0.01**

Table 3 presents a statistical comparison from the first measurement to the second one of the control group. Intervention and control * intervention, in isokinetic for the left leg:

a) In the left isokinetic the max strain max in rotation on extension change in the control group is (F = 18.462; sig. = 0.01), in the intervention group (F = 10.316, Sig. = 0.02) and in control*intervention (F = 45.455; sig. = 0.00).

b) In the left isokinetic the max strain max in rotation in flexion change in the control group is (F = 5.651, sig. = 0.06), in the intervention group (F = 13.966; sig. = 0.01) and in control*intervention (F = 06.779; sig. = 0.05).

c) In the left isokinetic the average strain max spin on extension change in the control group is (F = 5.934, sig. = 0.06), in the intervention group (F = 12.893; sig. = 0.02) and in control*intervention (F = 7.212, sig. = 0.04).

d) Inthe left isokinetic the average strain max in rotation in flexion change in the control group is (F = 9.826, sig. = 0.03), in the intervention group (F = 23.437; sig. = 0.01) and in control*intervention (F = 6.576; sig. = 0.05).

Table 3 The comparison between the control and the intervention group in the isokinetic force for the left (extension and flexion).

	Source	Type III S of S	Mean Square	F	Sig.
Izokinetik (Left) Avg ofPeak Torque Extension	Control	6.000	6.000	18.462	0.01
	Intervention	8.167	8.167	10.316	0.02
	Control * Intervention	**16.667**	**16.667**	**45.455**	**0.00**
Izokinetik (Left) Avg ofPeak Torque Flexion	Control	7.594	7.594	5.651	0.06
	Intervention	7.594	7.594	13.966	0.01
	Control *	**26.042**	**26.042**	**6.779**	**0.05**

	Intervention				
Izokinetik (Left) Avg Peak Torque Extension	Control	13.500	13.500	5.934	0.06
	Intervention	15.042	15.042	12.893	0.02
	Control * Intervention	**37.500**	**37.500**	**7.212**	**0.04**
Izokinetik (Left)Avg Peak Torque Flexion	Control	7.042	7.042	9.826	0.03
	Intervention	9.375	9.375	23.437	0.01
	Control * Intervention	**20.167**	**20.167**	**6.576**	**0.05**

Table 4 presents a statistical comparison from the first measurement to the second one of the control group. Intervention and control*intervention, in isokinetic for the right leg:

a) In the right isokinetic max muscular strain in rotation, in extension change, in the control group is (F = 5.559, sig. = 0.07), in the intervention group (F = 10.240; sig. = 0.02) and in the control*intervention (F = 16.000; sig. = 0.01).

b) In the right isokinetic max muscular strain in rotation, on change in the control group is (F = 9.275, sig. = 0.03), in the intervention group (F = 11.154; sig. = 0.02) and in control *intervention (F = 12.656; sig. = 0.02).

c) In the right isokinetic average muscular strain in rotation, in extension change, in the control group is (F = 13.286; sig. = 0.02), in the intervention group (F = 16.574; sig. = 0.01) and in the control*intervention (F = 6.361, sig. = 0.05).

d) In the right isokinetic average muscular strain in rotation, in flexion change, in the control group it is (F = 4.971, sig. = 0.08), in the intervention group (F = 14.745; sig. = 0.01) and in the control*intervention (F = 8.176, sig. = 0.04).

Table 4 The comparison between the control and intervention group in the isokinetic force for the right leg (extension and flexion).

	Source	Type III S of S	Mean Square	F
Izokinetik (Right) Avg ofPeak Torque Extension	Control	7.042	7.042	5.559
	Intervention	10.667	10.667	10.240
	Control * Intervention	**24.000**	**24.000**	**16.000**
Izokinetik (Right) Avg ofPeak Torque Flexion	Control	7.594	7.594	9.275
	Intervention	8.760	8.760	11.154
	Control * Intervention	**22.042**	**22.042**	**12.656**

Izokinetik (Right) Avg Peak Torque Extension	Control	12.760	12.760	13.286
	Intervention	14.260	14.260	16.574
	Control * Intervention	**30.375**	**30.375**	**6.361**
Izokinetik (Right) Avg Peak Torque Flexion	Control	7.042	7.042	4.971
	Intervention	12.042	12.042	14.745
	Control * Intervention	**20.167**	**20.167**	**8.176**

Table 5 presents a statistical comparison from the first measurement to the second one of the control group. Intervention and control*intervention, in Drop Jump test:

a) Drop Jump F max (k/N) change in the control group is (F = 6.36; sig. = 0.05), in the intervention group (F = 15.01; sig. = 0.01) and control*intervention (F = 8.68, sig. = 0.03).

b) Drop Jump F max (N/kg) change in the control group is (F = 7.28, sig. = 0.04), in the intervention group (F = 9.79, sig. = 0.03) and control*intervention (F = 7.84, sig. = 0.04).

c) Drop Jump F max (w/kg) change in the control group is (F = 38.19; sig. = 0.00), in the intervention group (F = 61.12; sig. = 0.00) and control*intervention (F = 28.44; sig. = 0.00).

d) Drop Jump time of contact (tc) change in the control group is (F = 0.35; sig. = 0.58), in the intervention group (F = 5.07; sig. = 0.07) and control*intervention (F = 1.87, sig. = 0.23).

e) Drop Jump air time (ta) change in the control group is (F = 3.61, sig. = 0.12), in the intervention group (F = 0.22; sig. = 0.66) and control*intervention (F = 0.04; sig. = 0.85).

Table 5 The comparison between the control and the intervention group in the Drop Jump Test.

	Source	Type III Sum of Squares	Mean Square	F	Sig.
Drop Jump Fmax (k/N)	Control	0.16	0.16	6.36	0.05
	Intervention	0.22	0.22	15.01	0.01
	Control * Intervention	**0.67**	**0.67**	**8.68**	**0.03**
Drop Jump Fmax (N/kg)	Control	33.16	33.16	7.28	0.04
	Intervention	40.53	40.53	9.79	0.03
	Control * Intervention	**139.11**	**139.11**	**7.84**	**0.04**
Drop Jump Power (W/Kg)	Control	11.13	11.13	38.19	0.00
	Intervention	16.60	16.60	61.12	0.00

Drop Jump Contact Time (tc)	Control	0.00	0.00	0.35	0.58
	Intervention	0.01	0.01	5.07	0.07
	Control * Intervention	**0.00**	**0.00**	**1.87**	**0.23**
Drop Jump Air Time (ta)	Control	0.00	0.00	3.61	0.12
	Intervention	0.00	0.00	0.22	0.66
	Control * Intervention	**0.00**	**0.00**	**0.04**	**0.85**

Table 6 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 6 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**

Table 7 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).

Table7 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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