Sports University of Tirana

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SUMMARY DISSERTATION

THEME: The role of physical components in the preparation of young football players, as the basis of sports results improvement.
One-year-study with young football player teams

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Introduction

Football is characterized by a series of acyclic actions that take place during a match in the form of high intensity running, jumps, head or foot shoots. These are mainly anaerobic activities, however, the power deriving from aerobic metabolism is used for 90% of footbollers movements and is a primary requirement for this modality. This aerobic dominance is associated with the duration of a football match (approximately 90 minutes) and large distances traversed by athletes during matches. In football there are numerous protocols for physiological assessment. Parameters used for assessing the aerobic fitness to football players include a maximum amount of absorbed oxygen (VO2 max), which corresponds to the maximum capacity of an entity to absorb, transport and exploiting the oxygen at the cellular level in the unit of time, the maximum speed (MS) which according Rampinini et al., is related to the distance covered by high intensity (19.8 km/h) and finally the anaerobic threshold and running dosing (RD), which also can be used to distinguish between the athlete's performance at different levels of competition.

Despite various researches have studied the aerobic parameters at football players, there are lacking studies assessing in details the characteristics associated with the determination of these parameters, particularly factors that affect the testing and standardization of methods.

Physiological parameters of aerobic fitness in football (under laboratory conditions)

Football is characterized by constant changes of intensity, short intervals recuperations, sudden stops and changes of direction. Football players make alternating effort during exercise and race. Notwithstanding these characteristics, the energy used by football players is mainly produced by aerobic metabolism, which relates to the capacity of the athlete to maintain intensity during a game through the break between high intensity stimuli. VO2 max is an indication of cardio-respirator fitness, which corresponds to the highest level where oxygen is absorbed and used by the body during maximum exercise, breath-suction at sea level. Representing the highest limit energy transformation through aerobic metabolism, VO2 max is considered to be the main physiological indicator of maximal aerobic power.

Several studies have analyzed VO2 max to football players.

Many of them report values ranging from 55 to 68 ml/kg/min, which are lower than those traditionally found in runners of sustainability (70 ml/kg/min). This difference is related to the training characteristics of runners of sustainability, which focused on capacity and aerobic power. Despite this, the footballers training includes alternating activities, repeated sprinting skills, speed strength and muscle strength, emphasizing aerobic fitness in specific time such as the beginning of the season. Other studies have compared the VO2 max between footballers that play in different positions.

Bangsbo et al. and Al-Hazza et al. studied professional players and found no significant difference between defensive midfielders or attackers/strikers. Unlike these, Balikian et al. noticed a significant change only when the goalkeepers results were compared with results obtained for other positions. Santos observing possible changes due to the position of athletes noted that VO2 max of side players (59.3 ± 3.6 mL.kg-1.min-1) and midfielders (59.5 ± 6.7 mL.kg-1.min-1) differed significantly from attackers (54.9 ± 8.2 mL.kg-1.min-1), while he did not notice any difference between the attachers (56.8 ± 5.5 mL.kg-1.min-1) and other positions. In accordance with these results, Bangsbo noticed the highest amount of VO2 max to the side players and midfielders (61.5 ± 10.0 and 62.6 ± 4.0 mL.kg-1.min-1, respectively) compared with goalkeepers (51 ± 2.0 mL. kg-1. min-1) and the attackers (56 ± 3.5 mL.kg-1.min-1).

Assessment of physical performance of an athlete

No doubt that racing provides better testing for an athlete, but it is difficult to isolate the various components within the sport and take objective measures of performance. Fitness testing provides useful information about specific parts of a sport. Before selecting a text, they should be defined clear objectives. Testing reasons for an athlete are as follows:

- To study the effects of a training program
- To motivate athletes to be trained more
- To give an objective assessment to the athlete
- To make a conscious athlete for training goals
- To assess whether an athlete is ready to compete
- To determine the level of performance of an athlete during a rehabilitaions period
- To highlight the weakness of an athlete

To provide useful information from a test it is important that the test be suitable and match the sport conditions. For example, a bike test is less important for a swimmer. There are several common laboratory tests used, which evaluate different aspects of the performance (Fig 2). These include determining the maximum absorption of oxygen to assess the athlete's ability to absorb and use oxygen. A Wingate test, consisting on maximum cycling on the bike determines the maximal anaerobic power and ability to maintain a greater force. Measurements of force in which is measured the strength of an isolated muscle group during isometric, concentrike contraction or those eccentric also used as laboratory tests. Such tests provide general information about the capacity of an athlete, and can share different levels of performance of athletes within a sport. In some sports, such general tests may give us data, for example, on the sport requirements. To be a cross-countrie skier of high level oxygen-absorbtion it is needed a maximum of oxygen-absorbtion higher than 80 ml min^{-1} kg^{-1}. These classic laboratory tests may also be useful for performance comparisons between different sports. However, in a small scale they can express only performance of an athlete during the race.

Methodology

1.1 Objective

The objective of this study is measuring, monitoring and comparing in-one-year training of young football players, of the physical components important in futher improvement of sports results.

1.2 Purpose

a- Measurement of physical components; maximum oxygen consumption (ergonometric bicycles, speed in both tests 30m and 50m, explosive strength measured with stationary long jump test and morphological parameters.

b- Division of levels of physical components assessments according to age group

c- Measurement variables in two stages (first and the second measurement) during a training year

d- Comparison of the parameters evaluated during a training year (giving descriptive and comparing statistical results)

1.3 Selection of the sample

In the study participated in total 250 players in three age groups ranging from age 17 to 19 years old. The standard deviation is 0.4 years for participants. In the first measurements (in the first period) participated 250 football players while in the second measurements have participated in 238 total players. Participating teams were selected randomly from a national database nearby AFF.

1.3 **Tools and methods**.

Theoretical support materials in this scientific work were demanded in the web data Capes, PubMed, Google Schoolar and JSTOR. Furthermore, the works were compiled from scientific conferences in the field of sports science and contemporary scietific works. In this regard initially were retreated articles and abstracts published after 2000. However, classical studies on this subject carried out in the 80s, and 90 were included in this study.

For evaluating the physical parameters were using these tests:

- **30m jogging speed**
- **50m jogging speed**
- **Stationary high jump (explosive force)**
- **Measurement of morphological parameters**
- **Maximum oxygen consumption (ergonometic bicycles)**

Measurements were carried out in two periods during the training year, in outdoor environments (speed and explosive strength) and laboratory environments (maximum consumption of oxygen and morphological parameters).

1.6 Statistical Processing

To perform data analysis is used the SPSS 17.0 software. The testing data of relevant variables were coded and placed in the database of EXCEL program and where from there are used in the SPSS program. It is carried out the descriptive analysis (total number of fooball players as for each age group and measurement (first and the second measurement) for max VO2 testing, speed (30m and 50m), explosive strength (stationary high jumping) as well as the averages in frequency or in percentage of data, standard deviation and minimum and maximum results achieved during testing. For these data are built tables and graphs of the relevant tests.

To perform a comparative analysis between the first measurement and the second one is performed ANOVA test and for those variables that have resulted in significant changes (sig / P ≤0.05) is carried out the test 'Post hoc Bonferroni. The level of reliability is set 95 percent (P ≤0.05).

Results

In the study participated in total 250 players in three age groups ranging from age 17 to 19 years old. The standard deviation is 0.4 years for participants. In the first measurements (in the first period) participated 250 football players while in the second measurements have participated in 238 total players. In the second period measurement were missing 12 footballers for health reasons.

Maximum oxygen consumption as the average for all participants football players is 55.3 ml / kg / min and an average for cardiac frequency is 66 beats per minute

Table 10 Descriptive data on cardiac freq, fat percentage and VO2max

Variable	Minimum	Maximum	Average	Dev Standard
Cardiac freq (rest)	60	73	66.017	3.7597
Measur. Abd fat (mm)	0.5	. 4	1.247	0.6293
Vo2max (mL·kg−1·min−1)	24	65	55.391	3.8937

Regarding the data on both measurements for averages variables it is noticed a minimal increase in cardiac frequency in the rest from 65.8 in the 66.1 beats per minute. In the first measurement the average data for the maximum consumption of oxygen is 54.5 ml/kg/min, while in the second one was 56.5 ml/kg/min. As evident from Table No. 11 it occurs an increase of 2 ml/kg/min from the first measurement to the second one, so an increase of maximal oxygen consumption.

Table 11 Descriptive data on cardiac freq, fat percentage and VO2max according the measurements

Measur.	Variable	Minimum	Maximum	Average	Dev Standard
First	Cardiac freq (rest)	60	72	65.82	3.9315
	Measur. Abd fat (mm)	0.5	3	1.294	0.5534

	Vo2max (mL·kg−1·min−1)	48	65	54.52	2.7048
Second	Cardiac freq (rest)	60	73	66.159	3.6527
	Measur. Abd fat (mm)	0.5	4	1.213	0.681
	Vo2max (mL·kg−1·min−1)	24	60	56.572	4.4067

In table 12 are provided data on the variables of speed in both tests 30m (average 4.13 seconds) and 50m (6.7 seconds) and also the measured explosive force test withe the stationary long jump (average 2.31 meters) tests.

Table 12 Descriptive statistics (data) for the three variables measured

	N	Minimum	Maximum	Average	Dev Standard
30m Speed	488	3.90	4.51	4.134	0.19
50m Speed	488	6.34	7.82	6.727	0.27
Expl. Force (long jump)	488	1.92	2.53	2.312	0.22

Statistical comparison between the first measurement and the second one for each variable is shown in the conducted test ANOVA (Table 16). As seen in the three variables that are taken in comparison it has statistical improvement (Sig = 0.000).

Table 16 ANOVA test throught the first and the second measurements for each variable

		Shuma e katrorit	Mesatare Katror	F	Sig.
30m speed	Between groups	0.954	0.954	29.283	0.000
	Within groups	15.826	0.033		
	Total	16.779			
50m speed	Between groups	2.984	2.984	46.056	0.000
	Within groups	31.485	0.065		
	Total	34.469			
Expl. Force (long jump)	Between groups	1.68	1.68	37.148	0.000
	Within groups	21.982	0.045		
	Total	23.662			

Statistical comparison between the first measurement and the second one for each variable is shown in the conducted test ANOVA (Table 16). As seen in the three variables that are taken in comparison it has statistical improvement (Sig = 0.000).

Table 17 ANOVA test throught the first and the second measurements for each variable acc. to age

Age			Shuma e katrorit	Mesatare Katror	F	Sig.
16 yrs old	30m speed	Between groups	0.131	0.131	4.024	0.047
		Within groups	5.314	0.033		
		Total	5.445			
	50m speed	Between groups	0.948	0.948	15.931	0.000
		Within groups	9.699	0.06		
		Total	10.647			
	Expl. Force (long jump)	Between groups	0.711	0.711	20.6	0.000
		Within groups	5.625	0.035		
		Total	6.336			

Age			Shuma e katrorit	Mesatare Katror	F	Sig.
17 yrs old	30m speed	Between groups	0.405	0.405	28.388	0.000
		Within groups	2.27	0.014		
		Total	2.676			
	50m speed	Between groups	0.818	0.818	15.437	0.000
		Within groups	8.426	0.053		
		Total	9.244			
	Expl. Force (long jump)	Between groups	0.295	0.295	7.198	0.008
		Within	6.509	0.041		

		groups				
		Total	6.804			

Age			Shuma e katrorit	Mesatare Katror	F	Sig.
18 yrs old	30m speed	Between groups	0.448	0.448	10.961	0.001
		Within groups	6.543	0.041		
		Total	6.991			
	50m speed	Between groups	1.125	1.125	23.387	0.000
		Within groups	7.698	0.048		
		Total	8.823			
	Expl. Force (long jump)	Between groups	0.681	0.681	14.078	0.000
		Within groups	7.74	0.048		
		Total	8.421			

The graphs 4,5,6 represent the average of three variables for the first and the second measuring respective by components.

Discutions

The performance of an athlete in elite sports depends on the athletes' techniques, technical, tactical, psychological/social characteristics. These elements are closely related to each other; for example the technical quality of an athlete can not be used if the athlete tactical knowledge is low. Physical requirements in a sport are connected with the activities of the athlete. In some sports, continuous exercise performed either with very high intensity (eg 400m running) or with moderate intensity (eg marathon) throughout the race.

Under optimal conditions, the requirements in sports are closely related to the physical capacity of an athlete, which can be divided into the following categories: (i) the ability to achieve prolonged exercise (consistency), (ii) ability to be exercised with high intensity, (iii) the ability to sprint, and (iv) the ability to develop a greater force in single action during the race, as it is the shot in football and the jump in basketball. The performance within these categories is based on the characteristics of the respiratory and cardiovascular system and muscles, combined with the interaction of the nervous system. Muscular system is composed of a plurality of components, which influence in the mechanical and metabolic muscle behavior.

Processes related to the recovery from the intense exercise are connected with the oxidizing ability as well as with the number of capillaries in the muscles. Thus, aerobic training, not only improves the performance duration of the athlete but it seems that affects his ability to perform maximaly in a consistent way. The overall goal of the exercise is to enhance aerobic performance during the race (competition) and also, in the games with the ball, to minimize the decrease of technical performance and recent loss of concentration during the game caused by fatigue. Aerobic exercise specific goals are:

- Improve the ability of the cardiovascular system to transport oxygen. In this way, a greater percentage of the energy needed for intense exercises can be provided in an aerobic way, allowing the athlete to perform exercises with high intensity for long periods of time.
- Improving the ability that muscles have to use oxygen and fat burning during prolonged exercise. Therefore, the limited amount of stored muscle glycogen and sportsman can withstand higher intensity during the end of a race.
- Improve the ability of recovery after a period of high intensity exercises in team sports. As a result, an athlete needs less time to recover before the next exercise carry a higher intensity.

Aerobic training can be divided in three combined components: aerobic training with low intensity (AerobicLl), moderate intensity (AerobicMO) and high intensity (AerobicHI; Figure 6). Table 1 shows the principles according to different categories of arerobic training, which take into account the fact that in some sports the training can carried aout as a game, and so, the athlete’s heart rate can change constantly during exercise.

During the AerobicLl training the athletes carry out light physical activity, such as light running and low intensity games. This type of exercise can head the day after the race/game or the day after a heavy training, in order to help the athlete to return to normal physical form. Also, it can be used in order to avoid what is called "toil" periods that include frequent sessions trainings and a busy competitive program.

The main aim of the moderate exercise is to increase capilarisation and muscle oxidative capacity (peripheral factors). The main purpose of this moderate training is to improve the central factors such as the pumping capacity of the heart, which is closely related to VO2max. These improvements enhance the ability of the athlete to be exercised continuously with high intensities for long periods of time. Figure 7 shows the change of the heartbeat for two football players that perform aerobic training with high intensity in an exercise called Pendulum.

The main purpose of this moderate training is to improve the central factors such as the pumping capacity of the heart, which is closely related to VO2max. These improvements enhance the ability of the athlete to be exercised continuously with high intensities for long periods of time.

The overall goal of the anaerobic training is to increase the potential of an athlete to perform a high intensity exercise. The anaerobic training specific purposes are summarized below.

- Improve the ability to act as quickly to produce rapid force. So an athlete reduces the time required to react and increases the performance of sprinting.
- To improve the ability to produce power and energy constantly through anaerobic ways of energy production. In this way an athlete increases the ability to perform exercises with high intensity for a longer period of time.
- To improve the ability to recover after a period of high intensity exercises, what is especially important during ball games. As a result, an athlete requires less time before it is neat to perform maximally exercises continued in the series, and in hand games, for this reason athlete will be also able to perform high intensity exercises frequently during the game.

By speed trainings is significantly stimulated glycotic ways and creatine kinase. The intensity of exercise should be almost in the maximum in order to provide greater adjustment to enzymes associated with anaerobic metabolism. In productive trainings the duration of the exercises should be relatively short (20-40s) and the rest of the exercises should be (2-4min) in order to maintain a high intensity during periods of exercise throughout a training session with intervals. In sustainability training the duration of the exercises should be 30-90s and the rest should be one to three times longer than periods of exercise, in order for the athlete to feel tired gradually. The adoptive adjustments from the sustainability training are localized mainly to acting muscles. In this way, it is important that an athlete to perform movements similar to those of the race, for example a oarsman should be trained in a boat or on a rowing ergometer. In ball sports this can be achieved by performing high intensity exercises or exercises with the ball.

The ultimate goal of training of the muscle force is to develop the athlete's muscle recovery. Specific goals of force trainings are:

- To increase muscle power during explosive activities such as jumping or acceleration
- To prevent injuries
- To regain muscular strength after an injury.

Conclusions

With appropriate training, the performance of an athlete can be increased, and the risk of injury can be reduced. To outline an efficient training program is important to be aware of the physical demands of the sport, athlete capacity that can be determined by various tests, and the different components of fitness training. Aerobic training increases the capacity to exercise with an overall higher intensity during the race, and minimizes the technical performance decline as by fatigue. Anaerobic training increases an athlete's potential to execute high intensity exercises. Force training combined with technical training improves the strength of an athlete during a game’s explosive activities. Fitness taining planning is essential to spot the elite, combined with physiological measurements taking into account individual needs.

Proposal for improving the performance in working with football players up to 18 years old

1. I propose to find children with physical and natural predisposition and normal anatomic-physiologic.
2. To distinguish children with quality according to the first point, by others that make recreational football.
3. Respect scientifically methodical requirements of the relevant age group.
4. On top of these groups of young players, should be selected qualified and passionate coaches.
5. To follow the concept that the coach helps the normal growth of a footballer and not to join the desire and passion of the parents to see their child a footballer earlier than they should. Facts have shown that, excluding talents, to a footballer it is need 7-9 years to be formed.
6. The most advanced schools that nowadays are called academies, have a certain percentage for them who begin football and become qualitative ones (5-7% of 100%).
7. Ensure basic infrastructure materials to achieve high scores (which unfortunately in our country is very poor).
8. In modern football, to successfully conduct a training process we must consider even the right nutrition in accordance with the requirements of the age and energy consumption in trainings. This makes necessary the cooperation with parents.
9. To ensure the formation of contemporary players it is necessary needed the cooperation with sports medicine.