

Anaerobic Capabilities of 8-9 Year-old Football Players

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Abstract. *Aim - to examine the functional status of 8-9 years old football players' cardiovascular system and their maximum alactic capacity. Materials and methods: the study was implemented at the Futsal club "Tyumen" (sport reserve training center) with the participation of 30 athletes of 8-9 years old. To assess the anaerobic capabilities of the tested people, a Wingate test was carried out using a BIKE MED vertical bicycle ergometer (TechnoGym, Italy) and CardioMemory V1.0 SP3 software. The results revealed individual and group characteristics of the cardiovascular system reaction, characteristics of peak and anaerobic capability in absolute and relative measures, as well as the "fatigue index" among the football players of 8-9 years old.*

Conclusion: *almost in all 8–9 years old football players the cardiovascular system displayed favorable response to anaerobic physical activity that on the whole indicates the rationality of the training process.*

The result of two athletes who revealed adverse reactions to physical activity require an additional profound medical examination. When planning and distributing physical activity, a coach should use individual indicators of peak capacity and time to peak capacity, as well as the fatigue index.

Key words - anaerobic capabilities, football players, Wingate test, cardiovascular system

I. INTRODUCTION

Monitoring physical fitness and functional condition of athletes at various stages of long-term sports training is an integral part of the quality management of the training process [3,8].

Today, different authors regard the issues on physical training of athletes who have various specializations and qualifications. Victor N. Seluyanov proposes to build a system of training athletes through the improvement of body energy supply processes [8].

A number of authors identify the problem of the training process individualization, taking into account the nature of the training effects based on the athletes peculiarities [1,4,5].

At the same time there is a contradiction between the necessity to individualize the training process and the insufficient knowledge of the metabolic energy processes as well as the adequacy of their response to physical activity starting from the initial stages of training.

Futsal is a dynamic, high-intensity sports game that requires a high level of anaerobic abilities.

Children start playing mini-football in sports groups and fitness groups from the age of 5-6 years. Despite this fact, the integrated control of their physical and functional condition starts much later at the stage of training or in professional sports [2,3].

A study of the mini-football players' anaerobic capabilities will allow to assess their functional status at the current moment of activity, to determine possible adverse reactions of the body to physical load, and also to qualitatively plan the training process taking into account the individual capabilities of the body.

II. MATERIALS AND METHODS

The study involved 30 boys aged 8-9 years engaged at Futsal club "Tyumen". Their sports activity experience was 3-4 years, including classes in fitness groups. At the time of testing all were healthy, with no pathologies and contraindications to participate in the training process, neither they had previous cold-related diseases less than two weeks before the test.

The study was conducted from February till March 2019 as part of a comprehensive survey related to the preparation of the team for the All-Russian futsal competitions.

We used the 30-second Wingate test to assess the anaerobic capabilities of the players.

Wingate test was carried out using a BIKE MED vertical bicycle ergometer (TechnoGym, Italy) and CardioMemory V1.0 SP3 software to assess the functional state of football players. The principle is as follows: a load of 7.5% from weight of the athlete is set on the wheel. The athlete gets used to the bike, the legs fixed on the pedals, the height of the saddle selected. A warm-up load is pedaling for 0.5 - 1.0 min at a convenient cadence. After the command *GO!* the testee performed the most abrupt set of rotations and pedaling with the highest athlete's capacity for 30 seconds. During testing, the athletes performed pedaling on a bicycle ergometer with a demonstration of maximum alactic capacity (MAC) and maintaining the maximum possible intensity until the end of the 30 second test. Prior to the test, the bicycle ergometer program automatically calculated resistance taking into account the weight and age of the testee. During testing, the researchers recorded the following data: maximum power (Watt), power and cadence. In the end of the Wingate test, the computer program calculated the average power (Watt), the degree of fatigue to reduce power in the test, as well as the time to reach maximum alactic power. In addition, taking into account the weight of the

testees, the relative values of all the above power indicators (Watt/kg) were calculated.

III. RESULTS AND DISCUSSION

Analyzing the performance indicators of the cardiovascular system of the football players before testing and three minutes after its completion (Table 1), we can note that on the whole all the parameters are within the age norm.

Table 1.

Performance indicators of the cardiovascular system of 8-9 years old football players before and after the Wingate test

Parameter	Before the physical load	3 minutes after the physical load
Heart Rate (bpm)	72±1.8	73.9±2.19
Systolic Blood Pressure (mm Hg)	107.7±1.34	112.9±2.86
Diastolic Blood Pressure (mm Hg)	61.9±1.78	66.1±3.66
Cardiac Output (l/min)	3.52±0.16	3.87±0.20
Cardiac index (l/min)	3.21±0.14	3.53±0.17
Total peripheral resistance	1862.9±88.2	1593.6±87.8

Three minutes after the exercise, heart rate and blood pressure returned to normal, which indicates a sufficient level of the children sport efficiency and an adequate response of the cardiovascular system to physical load [1,6].

The study showed that the heart responds adequately to the received physical load by increasing the cardiac output from 3.52±0.16 to 3.87±0.20 l/min and the cardiac index from 3.21±0.14 to 3.53±0.17 l/min/kg.

The decrease in the football players' total peripheral resistance from 1862.9±88.2 to 1593.6±87.8 indicates an adequate reaction from the vascular system.

However, it is worth mentioning that two people revealed the unfavorable reaction of the cardiovascular system. Particularly, one person showed a hypertonic type of reaction of the cardiovascular system to the load, while the other was hypotonic. At the same time, indicators of cardiac output and cardiac index decreased in comparison with the resting-state, and the peripheral vascular resistance increased. According to the test results, these athletes were temporarily suspended from training sessions. They were recommended to undergo an additional profound medical examination.

As the conducted study showed, when pedaling on a bicycle ergometer, the examined football players achieved the peak power at 11±1.7 seconds which was 6.1±0.8 Watt/kg in average. At the same time, according to the scientists, highly qualified football players show the time from 3 to 9 seconds to reach maximum pedaling power and usually it amounts to 11.74±0.8 Watt/kg [2,3]. As our practice and research show, the time to reach maximum capacity directly depends on and indicates the development of speed-strength abilities of athletes. Considering the age characteristics of the athletes examined, it should be noted that generally in the group this indicator is within the normal range.

Peak power is believed to be equal to the maximum alactacid component of anaerobic power. The average group indicators of peak capacity amounted to 200±30.5 watts. In this case, the scatter of the results among the tested was in the range from 172.4 Watt to 247.2 Watt.

Calculation of anaerobic capability of the tested people showed that the average group results for this parameter are 6.12±0.5 Watt/kg. The scatter of the results for this parameter was from 5.6 to 7.0 W/kg.

After reaching maximum power, 28 people showed a proportional decrease in power until the end of the test. This in general indicates an adequate reaction of the body to the given load.

At the same time, two people showed a wave-like change in pedaling power, after reaching peak capacity. These are athletes with unfavorable types of reactions of the cardiovascular system to dosed physical activity. Which, in our opinion, may indicate the lack of functional capabilities of students and the need for additional medical examinations.

Analyzing the "fatigue index" (or the rate of power drop), defined as the ratio of the difference between the maximum and minimum power in the test, by the time of the power drop, it should be noted that this indicator was in the range from 1.5 Watt/s to 2.9 Watt/s. The average group fatigue index for players aged 8-9 years was 2.1 Watt/s.

IV. CONCLUSION

A study of anaerobic capabilities of 8-9 years-old football players showed that:

- 1) The 28 out of 30 patients's reaction of the cardiovascular system is normotonic and reveals in an adequate increase of heart rate, blood pressure, cardiac output and cardiac index and a decrease in the total peripheral vascular resistance. This indicates the adequacy of the training effects.
- 2) Two people who showed hypertonic and hypotonic types of reactions to dosed physical activity require further profound medical examination.
- 3) The speed of reaching peak power of 8-9 years-old players while pedaling occurs at 11±1.7 sec. and amounts to 6.1 Watt/kg, and this is significantly different from the results of highly qualified football players. This fact indicates the underdevelopment of speed-power abilities in children.
- 4) In general, the anaerobic abilities of players of 8-9 years old are within the age limits and require appropriate correction during the training process. At the same time, training methods should be based on the principle of "nature-conformity" and take into account the individual capabilities of an athlete's body. So, in particular, it is important for a coach to take into account the speed of reaching the athlete's maximum anaerobic power when distributing speed and speed-strength loads.

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