

DETERMINATION OF AEROBIC INTENSITY (VO₂MAX) IN SPORT ZONES OF YOUNG SOCCER PLAYERS VIA IMPLEMENTATION OF IT TOOLS

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Abstract. *The physical and functional training of football players was determined in the phase of in-depth specialization of the training load at the intersection of aerobic tension zones. Also, a combined training was developed, which allows to adapt the intensity of the training load to the competitive one. As a result of determining the functional fitness of football players by the aerobic intensity factor (VO₂max), the average rate of HR was 173 b/m with a maximum power of 94.7%. Also, the training intensity was 2 minutes 50 seconds (10.5%) in the 3rd zone of aerobic intensity, 1 minute 20 seconds (5.3%) in the 4th zone of aerobic intensity and 1 minute 16 seconds (3.6%) in the 5th zone of aerobic intensity.*

Keywords: *aerobic intensity, sports zones, special endurance.*

I. INTRODUCTION

The latest advances in scientific research in the world are developing in sync with the high results of professional football. This trend is becoming integrated into the practice of football. In monitoring the physical and functional performance of young football players in the system of long-term complex training, researches were conducted using remotely controlled devices [2; 6; 8].

Special attention is paid to the development of national professional football in our republic. The victory of our compatriot players at the U20 Asian Championship in Uzbekistan in 2023 showed the need to further introduce innovative technologies in the long-term training of players. The President Republic of Uzbekistan has repeatedly emphasized the development of a scientifically based program for functional diagnostics in the activities of our young players.

The low level of physical fitness of young football players and its adaptation to international requirements requires the introduction of a new system of training young football players using modern methods [1].

The analysis of the studied scientific and methodical literature shows that the analysis of physical, functional and physiological indicators of young football players is closely related to the body component composition and morphofunctional indicators [9; 11]. Studies have been conducted on programming and optimization of training loads in the complex training of young football players, and the use of innovative pedagogical technologies in improving the physical and functional training of young football players [4]. On the other hand, other scientists have conducted research on the development of technical-tactical, physical and functional training of highly qualified football players, the organization of training loads, the improvement of the efficiency of technical movements of highly qualified football players, and the introduction of innovative pedagogical technologies in the management of the training process [1; 2; 5].

Due to the intensity of the games during the competition, it can be very difficult to maintain a high speed. In the process of training during the competition, taking into account the abilities of each player, it is necessary to develop their individual speed qualities [10; 15; 16]. As a result of young football players performing complex coordination movements and performing jumping exercises, it has been proven that athletes achieve development of quickness [7; 15]. Other experts have recommended the use of maximum volume shock training with balance intensity to improve speed qualities [4; 13; 18; 19].

In turn, it follows from the above conclusion that in practice, body composition parameters are not used in studying the training of young football players, which reduces the effectiveness of integral training. The integration of advanced technologies into professional sports is the reason for recording promising results in the world sports experience. However, the integration of innovative technologies and the research conducted in this regard have not developed the technology for the training of football players at the in-depth specialization stage, and the tasks, methods and tools at this most important stage of long-term training of football players have not been sufficiently defined [12; 13; 14].

In our republic, modern methods are hardly used in the process of physical and functional training of football players at the stage of in-depth specialization. In this article, using the modern method, the analysis of training load intensity in the form of distribution into “Sport zones”, i.e. “Aerobic intensity zones” is studied. For this reason, this article remains relevant.

II. METHODS AND MATERIALS

Polar team system 2, the second generation of research, is the ultimate solution for team sports. "Polar team system 2" allows you to monitor the load and analyze the training of each team player on the computer in real time.

"Polar Team System 2" heart rate monitor allows you to monitor the load in team sports and analyze the training of each team player on a computer in real time. As the number of players in the team increases, “Polar Team System 2” heart rate sensors are worn on the players and synchronize real-time HR data to the table (see Table 1).

Table 1

Information on the record of measurement parameters using the “Polar team system 2” heart rate monitor.

№	Name	Time	HR			Time in sports zones					Kcal
			Minim al	Aver age	Maxi mum	50-59	60-69	70-79	80-89	90-100	

When the number of players in the team increases, it can be supplemented with a “Polar team system 2” heart monitor or a set of 12 heart monitors with a charger included in the package (see Figure 1).

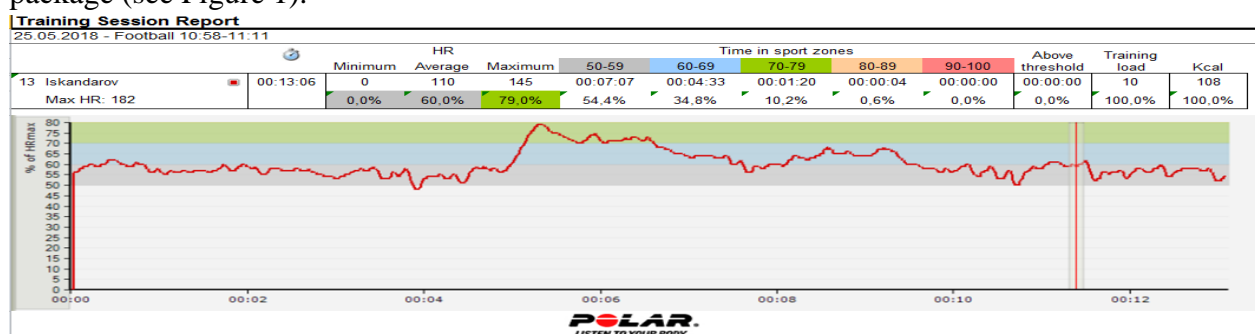


Figure 1. An example of a recording using the “Polar team system 2” device that detects HR

Figure 1 shows the data of the HR record of A-J teenager. The average rate of vascular warfare is 110 beats per minute, the maximum rate (HR max) is beats per minute. These data were recorded during the tests. HR parameters are divided into 5 zones with respect to the maximum vascular heart beat:

Zone 1: 50-59 scale, 54.4% of total time, duration 7 min 7 sec.

Zone 2: 60-69 scale relative to the maximum vascular war (HR max), 34.8% relative to the total time percentage, duration 4 min 33 sec was observed.

Zone 3: 70-79 scale relative to the maximum vascular heart beat (HR max), 10.21% relative to the total time, average duration in our study - 1 min 20 sec relative to the total time.

Zone 4: the maximum vascular heart beat (HR max) is on the scale of 80-89. 0.6% of the total time percentage, the duration in our study lasted 4 sec.

Zone 5: 90-100 scale with respect to the maximum vascular heart beat. In this sports zone, the player being checked did not have a score. The reason is that the player could not mobilize his strength enough, and the player's functional reserve in this zone was not at the required level.

The purpose of the study was to develop a methodological tool for matching the intensity of the training load to the intensity of the competition load during the physical and functional training of young players, and to determine the aerobic intensity zones of the training loads of the players. The tasks of the research are to develop the combined training tool in training young football players to have special endurance physical qualities and match the intensity of the training load to the intensity of the competition load, and to control the functional training of the players using the "Polar Team System 2" device in 5 sports zones of aerobic intensity (VO₂max) There was a study in the section.

III. RESULTS AND DISCUSSION

An increase in the level of maximum oxygen consumption helps to increase the intensity of the aerobic system [1; 8]. It is important to recognize that only one person in a hundred is determined by the type of genetic (hereditary) predisposition to achieve VO₂max values as a result of specific exercises. According to V.N. Platotnov research, 50-57 ml/kg/min of oxygen debt is not enough for highly skilled athletes. In professional teams of European countries, oxygen debt is 70-80 ml/kg/min [6].

In 16-17-year-old skilled players from Belarus, the limit of change is from 59 to 69 ml/kg/min, in 14-15-year-old players from 41 to 59 ml/kg/min. The maximum rate of heart contraction is 195 beats per minute in highly skilled players, 201 beats per minute in 16-17-year-old players [6; 8].

The pilot study of the research was conducted on the players of the in-depth specialization stage of the Republican Olympic Reserve College, and using the situational method, training tools were used to match the intensity of the game to the intensity of training. The exercises actually last 18-20 minutes. However, the time spent wearing the heart rate monitor "Polar Team System 2" on the players' body is 7-8 minutes on average. In the course of the study, the average number of heart contractions was 59.8% (from the maximum HR) during the exercise performed by the players using the situational method. The relative maximum heart rate was 94.7% (of the absolute maximum heart rate).

In 5 of the testers, compared to the rest of the players, they recorded a higher result in terms of functional training and intensity zones. Tester A-J player was in the fifth zone with 29.5%, the average result \bar{X} in this zone it was 54.1%. In the third zone 17.7% above the average (-10.5%)

+7.2% more, in the fourth zone 18.1% above the average (-5.3%) +12.8% in the fifth intensity zone 12% above the average (-3.6%) recorded a result of +8.4% more. E-A, O-D, T-Z and G'-X players had the highest results compared to the rest of the test subjects, as well as results above the average.

From 54.1% to 54.1% in the first intensity zone, it was -17.5% in the test T-Z player, -32.1% in the G-X test, -38.2% in the O-D test, and -39.4% in the E-A test. The highest score in this intensity zone was recorded in player T-Z, who spent the least amount of time in this “Weak” intensity zone, indicating that he had a strong development of functional reserve and physical performance. In the third zone, it was 10.5%, O-D player +9.5%, E-A player +8.3%, G-X player +4.8% and T-Z player +4.2% more results done. In this zone, the O-D player recorded +9.5% – a high efficiency. Tester A-J player recorded an average result of +7.2% among five subjects.

In the fourth intensity zone, from the average (-5.3%) O-D player +3.4%, T-Z player +2.2%, E-A player +1.5% and G-X player +0.7% scored high. Here, the indicator of the tester named A-J recorded the highest result (+12.8%).

In the fifth intensity zone, from the mean (-3.6%) E-A test +6.3%, O-D test +4.8%, T-Z test +3.9% and G-X test +0.7% - high efficiency. It should be noted that in this maximum intensity zone, as well as in the submaximal zone, the highest result was recorded in player A-J, i.e. from -3.6% to +8.4% on average (see Table 2).

Table 2

Aerobic intensity and maximal vascular resistance data recorded using the “Polar Team System 2” heart rate monitor.

№	Name	Time	HR		Time distribution by sports zones				
			Average	Maximum	50-59	60-69	70-79	80-89	90-100
1	A-J.	19:23	128	191	05:43	04:23	03:25	03:30	02:19
	HR max: 182		70%	104,4%	29,5%	22,6%	17,7%	18,1%	12,0%
2	O-Sh.	26:46	108	189	17:50	04:50	01:16	01:22	01:27
	HR max: 182		59,0%	103,0%	66,6%	4,8%	4,8%	5,1%	5,4%
3	J-Sh.	19:46	117	186	15:03	02:08	01:23	00:52	00:18
	HR max: 205		57,0%	90,0%	76,1%	10,8%	7,1%	4,4%	1,5%
4	A-H.	24:47	124	182	11:23	10:11	01:49	01:19	00:03
	HR max:: 205		60,0%	88,0%	45,9%	41,1%	7,4%	5,4%	0,2%
5	G-O.	24:51	97	178	21:51	00:56	01:15	00:46	00:01
	HR max: 205		47,0%	86,0%	88,0%	3,8%	5,0%	3,1%	0,1%
6	E-A.	26:47	127	192	03:56	13:20	05:01	01:49	02:39
	HR max: 182		69,0%	105,0%	14,7%	49,8%	18,8%	6,8%	9,9%
7	O-D.	22:09	127	190	03:31	10:24	04:25	01:55	01:51
	HR max: 182		69,0%	104,0%	15,9%	47,0%	20,0%	8,7%	8,4%
8	P-I.	22:52	92	176	17:56	01:43	01:25	01:04	00:41
	HR max: 182		50,0%	96,0%	78,5%	7,5%	6,3%	4,7%	3,0%
9	F-A.	23:39	114	109	12:10	07:08	01:24	01:21	01:34
	HR max::182		62,0%	104,4%	51,5%	30,2%	6,0%	5,8%	6,7%

10	T-Z.	31:21	118	175	11:27	11:41	04:37	02:21	01:12
	HR max::182		64,0%	96,0%	36,6%	37,3%	14,7%	7,5%	3,9%
11	S-S.	48:07	100	170	40:29	04:24	01:50	01:01	00:20
	HR max:: 182		54,0%	93,0%	84,2%	9,1%	3,8%	2,1%	0,7%
12	G-X.	48:01	122	188	10:33	25:13	07:20	02:51	02:03
	HR max: 182		67,0%	103,0%	22,0%	52,5%	15,3%	6,0%	4,3%
13	N-T.	22:53	93	160	19:39	00:59	01:41	00:32	00:00
	HR max: 182		51,0%	87,0%	85,8%	4,3%	7,4%	2,4%	0,1%
14	X-Sh.	48:07	104	179	37:14	06:11	02:02	01:38	01:01
	HR max: 182		57,0%	98,0%	77,4%	12,9%	4,2%	3,4%	2,1%
15	I-Sh.	13:06	110	145	07:07	04:33	01:20	00:04	00:00
	HR max: 182		60,0%	79,0%	54,4%	34,8%	10,2%	0,6%	0,0%
16	M-M.	12:26	127	162	04:47	04:56	02:33	00:06	00:02
	HR max: 203		62,0%	79,0%	38,5%	39,7%	20,5%	0,9%	0,3%
	\bar{X}_{medium}	27:38	113	173	15:22	7:26	2:50	1:20	1:16
			59,8%	94,7%	54,1%	25,5%	10,5%	5,3%	3,6%

When the average result of Absolute Maximum Maximum and Relative Maximum Intensity was determined among the subjects, 12 subjects were able to demonstrate that they could perform exercises at maximum intensity. Two players had 86% and 88% submaximal intensity ratio to the maximum peak number. In two other players, the average value of the maximum peak in the third intensity zone was found to be 79%. This indicates that the players could not mobilize their maximum potential. Such players will have to undergo regular medical examinations and regularly engage in physical and functional training.

For young football players, it is not only possible, but also necessary to carry out exercises in conditions of high values of vascular heart beat, that is, to perform exercises at maximum speed (increasing lactate anaerobic capacity), and the total training means can reach 50-60% in relation to size. The average ratio in percentage between complex and selective training is 40:50%. The share of high-load training reaches 40-60% of the total volume of training equipment.

V. CONCLUSION

Using "Polar Team System 2", the ease of determining the functional fitness of football players based on the factor of aerobic intensity ($VO_{2\text{max}}$) increases the effectiveness of such a diagnostic method, especially in the quick assessment of oxygen debt (organism's oxygen debt) and aerobic intensity, as well as in the distribution of $VO_{2\text{max}}$ in 5 intensity zones. The average indicator of the players' maximum HR was 173 beat/minute, with a maximum chance of 94.7%.

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