

## CORRELATION OF PHYSICAL AND FUNCTIONAL OF CARDIOVASCULAR YOUNG FOOTBALLER 14-16 YEARS

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**Annotation.** In a competition period were studied the indexes of general and special physical preparedness of young footballers aged 14 - 16 years old. On the basis of research of electrocardiograms dependence of indexes of physical preparedness of young footballers is presented on functional possibilities of the cardiovascular system. It is set that the dynamics of development of physical qualities of young footballers has heterochronic character. The level of physical preparedness of sportsmen is recommended to check on such by tests: at run on distance 15, 30, 60 meters from a place and 15 meters with to motion (for the estimation of speed motive qualities), at run on 400 meters (estimation anaerobic - to glicolic endurance); broad jump from a place, triple and upwards (estimation of dynamic force), at run on 3000 meters or during 12 minutes (estimation of aerobic endurance). The integral criterion of the special preparedness of footballers are competition performance indicators during a season (16 matches).

**Keywords:** young people, footballers, physical, preparedness, electrocardiogram, systole, volume, minute.

### Introduction.

Modern youth football developed through increasing requirements for all aspects of training of young players [6, 9]. In the process of competitive activity body has significant magnitude and duration of exercise, which require maximum mobilization of the organism of young athletes and place high demands on their preparedness. Therefore, the important task of training process is scientifically justified increase of general and special physical fitness of young football players according to the functionality [11, 13].

Competitive activity in modern football is characterized by significant increase in physical and mental stress, due to increased competition and large number of events.

So, an interest of football specialists cause requirements for general and special training [2, 8, 20]. Currently it is suggested many ways to assess the readiness of special players in competitive period, which are widely used in the process of observing the game of adults and young players.

The purpose of control according to V.M. Platonov, is an optimization of preparedness process and competitive activities on the basis of an objective assessment of various aspects of preparedness and functionality of major body systems [14]. It recorded a variety of factors as competitive and training activities, as well as the parameters of the functional state of the athletes [3, 5, 15, 17, 21]. Only in this case, we can correlate and analyze their significance. Results of the analysis provide the opportunity to develop programs and plans for training or make appropriate adjustment to their implementation [13, 21-23].

The study was conducted in accordance with the theme of research of department of football of Lviv State University of Physical Culture for years 2011 - 2015 "Scientific and methodological foundations of improving training of athletes in football with the peculiarities of competitive activity" of Consolidated Plan of research in the field of Physical Culture and Sports of Ministry of Family, Youth and Sports affairs.

### Aim, tasks, materials and methods.

*Aim of research* - to examine and analyze the performance of general and special training of young players and the functional state of the cardiovascular system after exercise.

*Object of research:* the process of physical training and its effect on cardio-vascular system of young players aged 14 -16 years old.

*Purpose of the study:* the relationship of indicators of physical preparedness and functional state of the cardiovascular system of young players aged 14 - 16 years old.

*Research objectives:* to analyze the performance of physical preparedness, physical development and functional status of young players aged 14 - 16 years old in the competitive period.

### Methods and organization of studies.

1. Theoretical analysis of specific references.
2. Testing of physical preparedness of players.
3. Teaching observation.
4. Analysis of competitive technical and tactical actions.
5. Anthropometry.
6. Functional tests.
7. Methods of mathematical statistics.

Research was carried out on a group of young footballers aged 14-16 years of SCYUSSHOR - 4 of the city Lviv in years 2010-2011.

In the process of preparedness of young players it is necessary to consider their physical development, functional, psychological state, physical preparedness [2, 5, 6, 10, 15]. During the study we established indices of physical development, functional, mental health of young footballers aged 14-16 years (Table 1).

In theory and practice football it is isolated settings of general and special physical training of young players aged 14-16 years [2, 6].

Table 1

*Indicators of physical, functional, mental state of young players aged 14-16 years.*

№	Type of preparedness	Control indicators	Indicators of preparedness (ages)		
			14 years	15 years	16 years
1.	Physical development	Mass of body (kg)	55,9±3,2	55,9±2,8	65,5±2,5
		Height(cm)	165±2,3	170±3,1	176±1,2
		Lung vital capacity (ml)	3900-4100	4500-4600	4800-5000
		Main force	100-120	120-140	150-160
2.	Functional state	PWC 170 (kgm/min/kg)	1400-1600	1600-1850	1800-2000
		MCK (ml/kg/min)	50-54	54-56	55-57
		ПAHO heart rate	145-155	155-160	160-170
3.	Psychological state	Courage	6,1	6,8	5,9
		Anxiety	3,9	4,5	5,9
		Emulative emotional stability	- 2,5	- 1,0	+ 0,1
		Sport motivation	1,0	0,5	2,1
		Stability	0	1,04	1,5

The level of physical preparedness of young athletes tested according to the following benchmarks: running at a distance of 15 m, 30 m, 60 m up and 15 m on the move (to assess the speed of motor skills), running at 400 m (estimate anaerobically-glycolytic endurance); broad standing jump, triple and up (estimate of dynamic power), running at 3000 m, or during 12 minutes (estimate aerobic endurance) [2]. The integral criterion of specially trained players are indicators of competitive activity, which averages during the season (16 games) are presented in Table 2.

Along with indicators of physical preparedness for determination of readiness for competitive activities of players an important are indicators of the functional state of the body, including the cardiovascular system [7, 15, 17]. Cardiovascular system, especially in boys, is one of the most vulnerable functional systems in the development of adaptation to high physical loads [3, 4, 10, 16, 18]. Systematic training causes an increase of left ventricle [16].

Table 2

*Indicators of physical preparedness and competitive activities of young players aged 14-16 years (n = 20).*

№	Types of preparedness	Control indicators, unit of measure	Indicators of preparedness, ages		
			14 years	15 years	16 years
1.	General physical preparedness	Standing running 15 m, c	2,5±0,3	2,4±0,2	2,3±0,2
		Running 15 m, c	2,1±0,2	1,9±0,1	1,8±0,1
		Running 30 m, c	5,0±0,4	4,8±0,2	4,5± 0,3
		Running 3x10 m, c	8,0±0,4	7,8±0,4	7,6±0,1
		Running 50 m, c	8,5±0,2	8,2±0,1	8,0±0,1
		Running 7 x 50 m, c	71,0±1,2	70,0±0,8	67,0±1,1
		Running 400 m, c	68±1,8	66±1,2	65±1,4
		Running 12 min, m	2850±43	2900±38	3000±18
		Long standing jump, cm	220±8	230±5	235±6
		Triple jump, cm	610±12	640±9	650±9
2.	Special physical preparedness	Standing jump up, cm	38±2,1	40±1,8	42±1,6
		Dribbling 30 m, c	5,8±0,12	5,6±0,18	5,3±0,14
		Kicking on ball on a distance, m	55±4	65±5	70±1
3.	Competitive activity (special preparedness)	Throw a ball on a distance, m	16±2	17±1	19±1
		Number of technical and tactical actions (TTA: short, medium, long passes, dribbling, hitting, selection, interception)	50-45	55-50	75 - 65
		Rejection rate (%)	34-32	34-32	40-35
		Dynamic movement in game, m	750-1000	850-1100	900 - 1200

Functional reserves of the cardiovascular system of children and teenagers are much lower than in adults [4, 18, 19]. Nervous and humoral mechanisms of effects on the cardiovascular system are not yet fully formed. Not improved of cardiovascular system is largely limits the possibility of long-term performance of children of heavy load, which often results in young athletes to overtraining and overexertion [4, 18].

Table 3 shows the changes of electrocardiogram in teenagers after exercises [17]. The nature of ECG changes after exercise reflects patterns of bioelectrical activity changes on early restitution.

Inconsistency in several changes of ECG intervals duration, amplitude and width of the teeth, rhythm, degree of reduction in the duration and cardiac cycle due both heterochrony in the relevant processes, and violation of the biochemical processes in the myocardium [18].

An important indicator of the functional state of the cardiovascular system is hemodynamic performance. According to some authors systolic blood volume in young athletes is much higher than systolic blood volume at their peers not sportsmen [3, 16, 19]. Other authors regarded the reduction of systolic blood volume at rest in young athletes, along with a decrease in heart rate as an indicator of economizing impact of exercises [16, 8]. Similar data were obtained by different authors, about minute volume of blood, volumetric flow rate. Abrosimova L.I., Karasik V.E., 1991, indicate, that the best option in response to regular physical activity is to reduce the resting volume flow velocity in the peripheral blood vessels [1], and increasing of minute volume of blood with a moderate increase in heart rate that responsible to isotonic type of hyperfunction of the heart according to F.S. Meyerson [12] and regarded as one of the most important features of economization of cardiac activity during physical exertion.

Table 3

*Variations of ECG changes after exercise at teenagers involved in sports*

№	Indicators of ECG	Зміни показників		
		Помірні	Виражені	Неадекватні
1.	Duration of cardiac cycle	Decreases proportionally to performance indicators	Decreases disproportionately to performance indicators	Significantly shortened disproportionately to performance indicators
2.	Heart rhythm	Stored sinus rhythm	Stored sinus rhythm	Appear extrasystoles and transverse and longitudinal blockade
3.	Respiratory arrhythmia	Disappears with increasing heart rate by 50% compared with the state of tranquility	Disappears with increasing heart rate by 25-30% compared with the state of tranquility	Grow or appear respiratory arrhythmia
4.	Electrical axis of heart	Shifted to the right to 30° or left to 5°.	Shifted to the right more than 30° or to the left to 15°.	Significantly shifted to the right more than 50° or to the left more than 15°.
5.	Electrical axis of teeth P, T and complex QRS	Unidirectional sliding right. The angle of divergence of electric axes of tooth T and complex QRS decreased or unchanged	Unidirectional multidirectional to axis of teeth P, T and complex QRS. The angle of divergence of electric axes of tooth T and complex QRS increase to 15°.	Unidirectional multidirectional to axis of teeth P, T and complex QRS.
6.	Intervals PQ, QRS and QT	Do not change or shorten proportionally to response of heart rate. QT interval shortened in proportion to heart rate response and its actual value is abnormal.	Shortened disproportionate response and performance indicators.	Increases the duration of intervals PQ and QRS. The discrepancy between actual and normal QT duration is more than 0.04 sec.
7.	Segments P – Q and S - T	Occur synchronous offset of segment P - Q and S - T to 1 mm below the baseline.	Occur synchronous offset of segment P - Q and S - T to 1,5 mm below the baseline.	Occur an isolated offset of segment S - T below the baseline.
8.	Tooth T	Amplitude does not change or changes only slightly.	Amplitude varies significantly.	Appears negative tooth T in the positive leads.

Adaptation of the cardiovascular system for hard muscular work in young athletes depends on age. So, at the age of 11-12 years adaptation of the cardiovascular system to veloergometry stress manifested in accelerating of cardiac activity with little change in systolic blood volume. And in young athletes of 13-14 years a character of adaptation is different: although the increase in heart rate is a major factor in the reaction, more noticeable increases systolic blood volume, especially increasing of training and sports qualification of teenagers (Table 4).

This suggests about reinforcement of positive inotropy of heart, increasing its capacity to create a new level of functioning of the cardiovascular system.

Table 4.

№	Age of children	Systolic blood volume (ml) at boys of 11-14 years with significant cycle loading	
		Not sportsmen X±Sx	Sportsmen X±Sx
1.	11-12 years	71,3±7,3	93,8±6,5
2.	13-14 years	84,5±8,4	90,7±6,4 (3-class) 95,4±6,2 (2-class) 120,2±7,5 (1-class)

### Conclusion.

1. The results of physical preparedness tests, observations of the technical-tactical actions in competitions for young players of 14-16 years found that they had slightly lower average of development of speed qualities, dynamic strength, anaerobic and aerobic endurance, compared with standard indicators program of SCYUSSHOR [2].

2. Studies have shown that in response to physical activity in young players observed functional changes in the cardiovascular system: bioelectrical activity of the heart, increased systolic and minute blood volume, cardiac hypertrophy. These changes contribute to the growth of functional and physical fitness.

3. Based on the analysis of performance of functional state of cardiovascular system and the physical preparedness of young football players of 14-16 years with the purpose to improve sports performance can make corrections of training programs.

*Prospects for further research* – correction of training programs, plans based on indicators of the functional state of the cardiovascular system and the physical preparedness of young players.

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**Cite this article as:** Swistun Y.D., Trach V.M., Chornobaj I.M., Zalisko S.V. Correlation of physical and functional of cardiovascular young footballer 14-16 years. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.1, pp. 74-78.  
doi:10.6084/m9.figshare.106943

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Received: 24.12.2012

Published: 31.01.2013