

## THE INFLUENCE OF THE EXPERIMENTAL PROCEDURE ON THE FUNCTIONAL STATUS OF SCHOOLCHILDREN INVOLVED IN THE VOLLEYBALL SECTION.

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**Annotation.** The effect of the experimental procedure on the cardiorespiratory system of schoolchildren involved in the volleyball section. The experiment involved 190 students aged 14-16 years with sports experience from one to three years. The study showed that practicing volleyball for one academic year (204 hours for 6 hours per week) contribute to more efficient operation of the cardiorespiratory system of 14-16-year-old athletes. This results in lower heart rate in 14 years, figures large lung capacity at 14 and 15 years of living index in 14 years. Recommended redistribution of load volumes aerobic-anaerobic nature in favor of the dominance of aerobic exercise, the increase in the total hours of physical training, insufficient targeting of motor abilities. It is recommended to carry out at each training session (35-40 minutes). The length of time for the development of aerobic capacity of the lesson is 15-20 minutes, the reaction rate of 8-10 minutes, 7-10 minutes of flexibility. The intensity of training on heart rate on average in the range of 125-155 beats per minute.

**Keywords:** functional status, cardiorespiratory system, athletes, volleyball players.

### Introduction

Trainings in sports circles shall be regarded as opportunity to have optimal scope of motion load, which is required for normal functioning of organism, its growth and development against the background of professional skillfulness increasing [8]. Alongside with wide spectrum of sport researches of volleyball training, health related influence of them on pupils' functional state has not been studied sufficiently yet.

Analysis of existing programs for circles' volleyball trainings [3, 5] showed that at 14-16 years old age it is recommended to increase the quantity of training hours for technical-tactic preparation at the account of reduction of general and special physical training. Alongside with it, as per already conducted researches, [1], age of 14-16 years old of tall pupils is characterized by certain straining of organism's functional systems and reducing of physical workability.

In some works there were studied development and control of special endurance of junior volleyball players [6], speed-power level of highly qualified volleyball players [4, 11]; a number of authors supply data about development of motion abilities and anthropometrical parameters of volleyball players of different qualification [9, 12, 16], there have studied influence of volleyball on cardio-respiratory system of 12-16 years old boys [15], prevention from traumatism among junior volleyball players [13], analyzed character and duration of intervals between games and in the middle of games for junior and highly qualified volleyball players. [14]. However, the problem of pupils' functional state improvement in the process of volleyball training in circles practically has not been regarded yet.

In this connection we researched influence of experimental methodic on functional state of 14-16 years old pupils, who train volleyball.

The work has been fulfilled as per combined plan of scientific-research works in the sphere of physical culture and sports for 2006-2010 of Ministry of family, youth and sports of Ukraine by subject 3.2.7.1, it. "Physical workability and its somatic vegetation and motor provision for different contingents of children and teenagers" (state registration number 0107U001186).

### Purpose, tasks of the work, material and methods

*The purpose of the work* is to study influence of experimental methodic on functional state of 14-16 years old pupils, who train volleyball.

#### *Methods and organization of the research*

In the process of our study we applied the following methods of research: general scientific (analysis, systemizing, generalization), pedagogic (testing, formation experiment), medical-biological (spirometry, peak flow metering, pulse metering), mathematical-statistic.

*Experimental methodic* of training was developed considering existing experience [3, 5] and was designed for one academic year from September to May or 35 weeks (204 hours, 6 hours per week).

*Main specificities of the experimental methodic* are redistribution of anaerobic-aerobic loads' scopes; increasing of hours, assigned for general physical training; purposeful influence on poorly developed motion abilities, which was realized at every training (35-40 minutes and was called "block-correction", three-four times a week. Duration of time devoted to development of aerobic abilities was 15-20 minutes; development of quickness took 8-10 minutes, development of flexibility – 7-10 minutes; intensity of trainings, as per heart beat frequency, was in the range of 125-155 b.p.m. With it, we based on the fact that after training with optimal loads' parameters, post training adaptation effect preserved for 48 minutes, after 72hours it significantly reduced, after 144 minutes – practically disappears [2].

Trainings as per experimental methodic were conducted on the base of experimental site of HBO – children comprehensive school № 20, Lutsk. Formation pedagogic experiment covered 190 pupils, who train volleyball for period from one to three years. Control group included 98 persons (32- of 14 years old, 30 – 15 years old and 36 – 16 years old age), experimental group consisted of 92 persons (32- 14 years old, 30- 15 years old and 30 – 16 years old age).

At the end of academic year we examined cardio-vascular and respiratory systems by the following indicators: vital capacity of lungs (VCL) (ml), maximal speed of inhale and exhale air flow (l.p.sec.<sup>-1</sup>), heart beat frequency (HBF) in rest (b.p.m.) BP (mm. of merc. col.) and life index (ml..kg<sup>-1</sup>) [7].

Functional examinations were conducted on the base of functional diagnostics and physical rehabilitation laboratory of Lutsk institute of human development of University “Ukraine”.

Conclusions, concerning effectiveness of the offered program we made after comparing of data, obtained in experimental and control groups, applying such criteria as : quantity of studied indicators, significance of which substantially (on the level from p<0.05 to p<0.001) changed in the course of experiment, quantity of researched indicators, which had the highest values at the end.

### Results of the researches

Effectiveness of optimization programs of morpho-functional, motion development and physical workability of 14-16 years old boys in the process of volleyball trainings at circle, were studied with comparing of control and experimental groups’ data at the end of academic year and by comparing of the obtained data with data of other authors (see table 1).

One of the simplest, most accessible and rather informative indicators of blood circulation indicators (and sometimes of physical condition) is heart beat frequency (HBF). It can change depending on different reasons, including emotional ones (excitation, pre-start state). Training, especially for endurance, facilitates reduction of HBF in rest. Increased HBF in rest during more than three days can be regarded as a signal about mistakes in training mode or about health disorders [10].

In the process of our researches we determined statistically significant difference between HBF indicators of experimental and control groups’ 14 years old volleyball players (p<0.05). Concerning boys of 15 and 16 years old statistically significant difference was not observed.

The obtained results are quite logic, because it is a common knowledge that as a result of training loads, especially oriented on development of endurance, HBF in rest noticeably reduces [10].

As it is noted by V.I. Kovtsun [6], physiological intensity of motion activity in game conditions by data of HBF is little informative, is to compare it in age groups 13-14, 15-16 and 17-18 years old age.

It is connected with natural age dynamics of maximal HBF, level of sympathetic-adrenaline system’s response to significance of competitions, to adversary and etc.

The trend to HBF in rest reduction of all age groups’ boys of experimental group after pedagogic experiment witnesses favorable character of heart adaptation to aerobic physical loads. The data, obtained after formation experiment, point at absence of substantial changes in systolic BP. In all groups of boys there was a trend to its increasing. The trend to increasing of diastolic BP was observed in both groups of volleyball players that positively influences on pulse BP indicators and witnesses about more saving mode of heart’s work.

Table 1

*Indicators of cardio-respiratory systems in rest of 14-16 years old boys of experimental and control groups after application of experimental methodic*

Indicator	Age	Group	n	X	Sx
Heart beat frequency, b.p.m.	14	Control	32	79.38	3.97
		Experimental	32	76.97*	3.61
	15	Control	30	75.73	8.41
		Experimental	30	74.07	6.80
	16	Control	36	73.17	9.19
		Experimental	32	73.00	8.40
Systolic BP, mm of merc. col.	14	Control	32	112.00	11.35
		Experimental	32	112.06	9.76
	15	Control	30	117.60	21.32
		Experimental	30	116.33	19.10
	16	Control	36	118.61	12.51
		Experimental	32	117.47	9.96
Diastolic BP, mm of merc. col.	14	Control	32	68.75	11.89
		Experimental	32	68.47	11.26
	15	Control	30	75.00	15.76
		Experimental	30	74.17	14.09
	16	Control	36	76.22	9.26
		Experimental	32	75.30	8.53
Pulse BP, mm of	14	Control	32	43.25	8.69

merc. col.	15	Experimental	32	43.59	8.85	
		Control	30	42.60	9.68	
	16	Experimental	30	42.17	8.87	
		Control	36	42.39	1.,04	
	Vital capacity of lungs, l.	14	Experimental	32	42.17	9.63
			Control	32	3.25	0.26
15		Experimental	32	3.51***	0.23	
		Control	30	4.46	0.86	
16		Experimental	30	5.54***	0.80	
		Control	36	5.22	1.00	
Relative vital capacity of lungs, Life index, ml.p.kg.	14	Experimental	32	5.43	0.84	
		Control	32	52.64	3.44	
	15	Experimental	32	57.15***	4.18	
		Control	30	65.37	1.70	
	16	Experimental	30	66.97	12.21	
		Control	36	70.24	11.81	
Maximal exhale speed, l.	14	Experimental	32	72.00	9.07	
		Control	32	2.75	0.15	
	15	Experimental	32	2.80	0.18	
		Control	30	3.69	0.75	
	16	Experimental	30	3.81	0.64	
		Control	36	4.23	0.67	
Maximal inhale speed, l.	14	Experimental	32	4.36	0.59	
		Control	32	2.40	0.32	
	15	Experimental	32	2.49	0.29	
		Control	30	3.67	0.54	
	16	Experimental	30	3.70*	0.44	
		Control	36	4.69	1.11	
		Experimental	32	4.76	1.12	

Notes: \* –  $P < 0.05$ ; \*\* –  $P < 0.01$ ; \*\*\* –  $P < 0.001$  comparing with control group.

Thus, our research showed that volleyball trainings in conditions of experimental methodic facilitate more effective functioning of cardio-vascular system of 14-16 years old sportsmen in comparison with volleyball players of control group, that was expressed in less frequency of hear beats ( $p < 0.05$ ) of 14 years old boys.

Main parameters, which characterize human respiratory system, are vital capacity of lings (VCL), functional tests of respiratory system, maximal volume speed of inhale and exhale (MVS).

VCL is an important functional indicator of external breathing. It depends on sex, age, size of body and physical condition.

Examination of VCL showed statistically significant difference between indicators of experimental and control groups (boys of 14-15 years old) ( $p < 0.001$ ).

Study of life index of junior sportsmen showed that it was statistically significantly higher in experimental group of 14 years old volleyball players in comparison with boys of control group, with  $p < 0.001$ .

We found no statistically confident difference between LI experimental and control groups' indicators, concerning boys of 15 and 16 years old..

Examination of maximal volume speed of exhaled air flow (MVS of exhale) showed increase of this indicator with age both in control and experimental groups.

Power of breathing muscles, as well as bronchial conductivity, is evaluated by maximal volume speed of exhaled air flow (MVS of exhale) and inhaled air flow (MVS of inhale). Examination of MVS of exhale showed that there is no statistically confident difference between groups.

The trend of indicators' increasing with age was noticed also during analyzing of MVS of inhale results (see fig.6). Comparative analysis of MVS of inhale did not show any statistically significant difference between indicators of both tested groups' sportsmen.

Testing of respiratory system's functional state showed that volleyball trainings in conditions of experimental methodic are expressed to the largest extent in indicators of vital capacity of lungs of 14 and 15 years old boys ( $p < 0.001$ ) and life index ( $p < 0.001$ ) of 14 years old boys.

The carried out research proved that, considering peculiarities of morpho-functional development of 14-16 years old pupils, it is possible to raise general state of health and improve functional state. Realization of experimental methodic in complex with consideration of functional and motion development permit to raise efficiency of pedagogic process, increase pupils' interest in physical exercises' practicing and, thus, facilitate formation of pupils' optimal physical condition.

Studying of cardio-vascular system's functional state showed that volleyball trainings in conditions of experimental methodic facilitate its more effective functioning, concerning 14-16 years old sportsmen, if compare with volleyball players of control group, that is expressed in reduced heart beats frequency of 14 years old boys ( $p < 0.05$ ).

Studying of respiratory system showed that volleyball trainings in conditions of experimental methodic are expressed in higher indicators of VCL of 14 and 15 years old boys ( $p < 0.001$ ) and life index of 14 years old boys ( $p < 0.001$ ).

#### Conclusions:

On the base of the obtained by us results we can affirm that offered experimental methodic is an effective mean of improvement of 14-16 years old boys' functional state in the process of volleyball trainings in sport circles. Application of the offered methodic during one academic year permits to achieve much higher values of cardio-respiratory systems' indicators than application of existing programs and it also witnesses effectiveness of the first.

*The prospects of further researches* in this direction imply studying and consideration of functional abilities of physiological systems, which ensure muscular work, in the process of training loads' planning for junior sportsmen of other age groups.

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