THE COMPARATIVE CHARACTERISTIC OF INFLUENCE OF UNITARY STATIC AND DYNAMIC EFFORTS WITH OWN WEIGHT OF A BODY ON PARAMETERS VARIATIONAL PULSE RATE AT THE BOYS AGED 10 – 11 YEARS

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Annotation. The features of rhythm of heart-throbs are studied at implementation of single static and dynamic efforts with the deadweight of body for boys. 100 boys participated in research (age 10 - 11 years). The analysis of function of heart of teenagers was conducted through the method of method variational pulse rate. As static exercises utillized bending hands on a cross-beam and withholding of vertical position of body in support on the squared beams. As dynamic - at run on 30 meters and exercise with a rubber shock absorber. It is set that authenticity of distinctions from influence the static and dynamic loading is in ten year age, divergence is 117% at implementation of dynamic exercises. It is set that the index of index of tension after the physical loadings is marked reliable changes the degree of tension of mechanisms of adjusting of cardiac activity. During renewal this index gradually goes back to the basic data and below. State information is got neurohormonal mechanisms of regulative cardiac activity.

Keywords: static, dynamic, efforts, variational pulse, pulse, boys.

Introduction

Modern conception of physical education, which is directed to health improvement and cultivating of vitally important physical abilities, includes different kinds of motion activity, which manifest in static and dynamic loads. In practice it is hard to determine what effort is more difficult for a schoolboy, how one kind of effort yields the other or exceeds it; it can be only theoretically discussed. However, using modern methods of mathematical analysis of heart beat frequency, which is in opinion [7] is the most reliable criterion of vegetative nervous system's functional state, it is possible to receive general information about health state and compare the extent of certain motion acts' influence on organism, comparing with other. Similar experiments have already carried out, but they include differentiated researches of every group of efforts. For example N.A. Panova, V.A. Borodinov, T.G. Oleshkevich researched dynamic efforts – 140 squatting per minute [10]. R.M. Bayevskiy, S.Z. Kletskin, I.G. Tazetdinov, A.S. Khamitov also researched dynamics: running on the spot during 15 seconds at maximal speed [3], V.L. Babiy and M.V. Malikov included systemic trainings of lawn tennis into their researches [2]. In opposite to above mentioned authors G.V. Alferova and V.A. Koltyshev studied static tension of hand [1] O.N. Khudoley gave everyday training loads to young gymnasts [12]. To these scientific articles we can add great list of scientific essays, which deal with the problem of variability and structure of heart rhythm, mainly under dynamic loads [4;5;6;11] and to less extent under static.

However, up to the present time, nobody have compared static effort with dynamic and, thus, revealed their difference or similarity. Analysis of scientific sources of available literature did not give any information about comparison of static and dynamic efforts by variation pulse metering indicators.

Purpose, tasks of the work, material and methods

The purpose of the work is determination of heart beat rhythm's peculiarities with fulfilling of static and dynamic exercises by 10-11 years old boys.

The methods of the research – variation pulse metering, mathematical statistics, pedagogical observations, comparative analysis. For processing of mathematical data program Excel was used.

Organization of the research. The research covered boys of ten eleven years old, who, by his state of health, related to main health group and attended optional physical culture classes twice a week. Total quantity of the tested was one hundred persons. The groups were divided by age categories: 50 persons of every age. In the course of experiment schoolboys executed static efforts with own mass of body and dynamic. Static exercises were the following: hang on bent arms on horizontal bar, maintaining vertical body position resting on parallel bars. Dynamic exercises: running 30 meters with maximal speed, exercise of complex coordination with rubber expander (to be fulfilled maximal quantity times with maximal speed at one attempt), which had speed-power orientation. Two, from mentioned exercises were already tested in previous researches, i.e. hang on bent arms on horizontal bar [9] and exercise with rubber expander [8]. That is why these exercises were not strange for schoolboys, as well as 30 meter run. But maintaining vertical body position resting on parallel bars made its new demands: it was prohibited to part legs and bend knees, if elbows start shuddering and body deviated from vertical position backward or forward, the exercise stopped immediately. This experiment did not consider such indicators as height and mass of body, the time of static positions was not registered as well as quickness and number of repetitions on rubber expander; just all exercises were fulfilled at their most.

Registration of heart beat rhythm was carried out with the help of Heart Screen 80 GL synchronized 12 channel ECG instrument with 80 mm three channel Ж К display in НИИОЗДП. At the first stage of experiment we obtained initial data by four statistic indicators of heart rhythm in the state of relative rest; new data of these indicators

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were registered already by every exercise separately in the states just after load and in ten minutes after load, see table 1.

Table 1

Statistic indicators of heart rhythm M, M_O , AM_O , BP in rest, immediately after single static and dynamic load and in ten minutes after load by every exercise (10-11 years old boys)

Indicator	Quantity of	Age years	State of rest	Hang on bent arms		30m run		Vertical resting on parallel bars (legs closed)		Expander exercises	
				Immediately after load	10 minutes after load	. Immediately after load	10 minutes after load	Immediately after load	10 minutes after load	Immediately after load	10 minutes after load
M	50	10	0,71±0,02	0,74±0,02	0,70±0,03	0,73±0,02	0,71±0,03	0,75±0,02	0,70±0,03	0,76±0,02	0,71±0,03
	50	11	0,76±0,02	0,69±0,02	0,70±0,03	0,70±0,02	0,71±0,03	0,69±0,02	0,69±0,03	0,71±0,02	0,70±0,03
M_O	50	10	0,67±0,02	0,72±0,02	0,66±0,03	0,73±0,02	0,64±0,03	0,74±0,02	0,67±0,03	0,73±0,03	0,66±0,03
	50	11	0,74±0,02	0,71±0,02	0,69±0,03	0,70±0,02	0,68±0,03	0,71±0,02	0,68±0,03	0,70±0,02	0,69±0,03
AM_O %	50	10	50,6±2,03	41 ± 1,39	49,1±1,66	43 ± 1,4	47,8±1,42	41,5±1,47	48,5±1,53	43,1±1,58	48±2,21
	50	11	42 ± 1,23	36,2±2,39	51,9±2,1	35,5±2,14	49,7±2,07	36±2,14	52,8±2,36	36,9±2,15	50±2,18
BE	50	10	0,19±0,02	0,29±0,02	0,21±0,03	0,28±0,02	0,20±0,03	0,29±0,02	0,19±0,03	0,29±0,03	0,21±0,03
	50	11	0,25±0,02	0,34±0,02	0,18±0,03	0,35±0,02	0,17±0,03	0,36±0,02	0,20±0,03	0,35±0,02	0,21±0,03

From the obtained data we can conclude that after physical loads such heart beat rhythm indicators as mode amplitude AM_O variation excursion BE significantly increase in comparison with other indicators. After loads, by variation duration the group of ten years school boys in every exercise corresponds to moderately expressed sinus arrhythmia CA_1), while the group of eleven years old schoolboys corresponds to moderately expressed sinus arrhythmia (CA_2). Rather sufficient differences were found in the state of relative rest, confidentiality of data are confirmed by statistic indicators of heart rhythm M_O, AM_O и BP; the exclusion was indicator of expectation value (M), which is not confident, see table 2.

Table 2

Confidentiality between groups in the state of relative rest

Q-ty of persons	Age, years	M		M_O		AM_O %		BE	
50	10	0,71±0,02	t = 1,8 P > 0,05	0,67±0,02	t = 2,5 P < 0,05	50,6±2,03	t = 3,6 P < 0,001	0,19±0,02	t = 2,1 P < 0,05
50	11	0,76±0,02		0,74±0,02		42 ± 1,23		0,25±0,02	

In the course of observation it was also revealed that, comparing indicators of heart rhythm by every, separately taken exercise inside groups and between ages, after loads or in recreational process, it is, unfortunately, impossible to obtain required information about how changes between static and dynamic loads are expressed. For the most part the data were not confident. Actually they were the data not about the differences between loads, but, rather, the data about differences between indicators, that is quite other thing. That is why for determination of changes, which appear after single static or dynamic load, we used index of tension (IT) by Parin – Bayevskiy, whose derivative integral indicator was calculated by the following formula:

$$IT = AM_O / 2 \times M_O \times BP$$

In this connection, on the second stage we had to process the obtained results again, in order to reveal confident differences between loads. From data base we chose numerical series of appropriate variation indicators and calculated by the mentioned formula. After this, further processing by mathematical statistics was fulfilled for checking confidentiality. The obtained results of tension index (IT) were compared with individual indicators of heart rhythm of

persons with different functional state, as per table (by Yu.A. Paryshkin and V.V. Aksenov, 1987) were IT indicators: 8.6-high; 78.2-middle; 275-low.

Table 3

Index of tension (IT) data by Parin- Bayevskiy after staic and dynamic loads

Q-ty of persons	Age, years	Hang on bent arms	30m run	Vertical resting on parallel bars	Expander exercises
50	10	103,6 ± 3,3	116,5 ± 5,1	102,3 ± 3,3	125,3 ± 7,8
50	11	72,1 ± 2	70,3 ± 1,2	68,6 ± 1,2	72,5 ± 2,3

From the obtained data it follows, that eleven years old children have higher level of functional capabilities that ten years old.

Table 4

Confidentiality of IT changes after static and dynamic loads between ages

Exercise	Q-ty of persons	Age, years	Index of tension (IT)	
Hang on bent arms	50	10	103,6 ± 3,3	t = 8,2
	50	11	72,1 ± 2	P <0,001
30m run	50	10	116,5 ± 5,1	t = 8,8
	50	11	70,3 ± 1,2	P <0,001
Vertical resting on parallel bars	50	10	102,3 ± 3,3	t = 9,6
	50	11	68,6 ± 1,2	P <0,001
Expander exercises	50	10	125,3 ± 7,8	t = 6,5
	50	11	72,5 ± 2,3	P <0,001

The obtained data witness that between age of ten and eleven years old, immediately after single static and dynamic load confident changes are observed at ten years schoolboys. These changes concern the extent of tension of heart activity regulation mechanisms.

Table 5

Confidentiality of IT changes under static and dynamic loads inside groups

Exercise	Q-ty of persons	Age, years	Index of tension (IT)	
Hang on bent arms	50	10	103,6 ± 3,3	t = 2,1
30m run	50		116,5 ± 5,1	P < 0,05
Hang on bent arms	50	10	103,6 ± 3,3	t = 2,6
Expander exercises	50		125,3 ± 7,8	P < 0,05
Vertical resting on parallel bars	50	10	102,3 ± 3,3	t = 2,3
30m run	50		116,5 ± 5,1	P < 0,05
Vertical resting on parallel bars	50	10	102,3 ± 3,3	t = 2,7
Expander exercises	50		125,3 ± 7,8	P < 0,05
Hang on bent arms	50	11	72,1 ± 2	t = 0,8
30m run	50		70,3 ± 1,2	P > 0,05
Hang on bent arms	50	11	72,1 ± 2	t = 0,1
Expander exercises	50		72,5 ± 2,3	P > 0,05
Vertical resting on parallel bars	50	11	68,6 ± 1,2	t = 1
30m run	50		70,3 ± 1,2	P > 0,05
Vertical resting on parallel bars	50	11	68,6 ± 1,2	t = 1,5
Expander exercises	50		72,5 ± 2,3	P > 0,05

As a result of comparing static exercise with dynamics inside every group, solid confidentiality was found in the group of ten years schoolboys; concerning the group of eleven years old schoolboys the changes are not confident.

Table 6

Confidentiality between ages by initial data of tension index

Q-ty of persons	Age, years	Index of tension (IT)	
50	10	248,8 ± 15,4	t = 7,3
50	11	129,3 ± 5,5	P < 0,001

Initial data of tension indices confirm the presence of confidentiality between ages (see table 2 – confidentiality between groups in the state of relative rest). In spite of higher confidentiality, initial indicators of tension indices (IY) of both groups in the state of relative rest correspond to middle level of endurance.

Table 7

Confidentiality of IT changes after 10 minutes restoration inside groups

Exercise	Q-ty of persons.	Age, years	State	Index of tension (IT)	
Hang on bent arms	50	10	Initial	248.8 ± 15.4	t = 0,1
	50		Restored	251,3 ± 15,9	P > 0,05
30m run	50	10	Initial	248.8 ± 15.4	t = 1
	50		Restored	271,5 ± 16,9	P > 0,05
Vertical resting on parallel bars	50	10	Initial	248.8 ± 15.4	t = 2,7
	50		Restored	368,5 ± 41,5	P < 0,05
Expander exercises	50	10	Initial	248.8 ± 15.4	t = 2,3
	50		Restored	328,9 ± 30,6	P < 0,05
Hang on bent arms	50	11	Initial	129,3 ± 5,5	t = 6,8
	50		Restored	481,2 ± 51,3	P < 0,001
30m run	50	11	Initial	129,3 ± 5,5	t = 6
	50		Restored	630,7 ± 83,1	P < 0,001
Vertical resting on parallel bars	50	11	Исход.	129,3 ± 5,5	t = 6,4
	50		Restored	317,1 ± 28,6	P < 0,001
Expander exercises	50	11	Initial	129,3 ± 5,5	t = 6,7
	50		Restored	302,5 ± 25,4	P < 0,001

In the table we can see, that restoration in full rest was not an equal process in the groups. In the table we can see that restoration in full rest is not similar in both groups. Besides, eleven years old pupils' group is at lower level of heart rhythm functional capabilities, than ten years old pupils' group. Therefore, restoration period after inadequate conditions of single static and dynamic loads can influence differently on tension of regulatory links of cardiac vascular system, concerning the age.

Conclusions

1. In ten years old age, after single affect of every load tension index insignificantly increases and in restoration period its indicators become close to initial data. In eleven years old age the index's after load indicators significantly increase, that result in change of confidentiality between static and dynamic exercises, however, in the period after load tension index, in this age, gradually restores.

2. Confidentiality of differences between static and dynamic loads influence also exists in ten years old group, the variance is of 117% with dynamic exercises.

3. After load tension index indicator is marked by confident changes of tension degree of heart activity regulation mechanisms, but in restoration period it gradually returns to its initial value and even lower.

The prospects of further researches. It is stipulated to conduct study of cardiac-vascular system response to dosed static exercises with own body mass.

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