Account of the functional state indicators of men 40-60 years old leading a sedential life during physical and recreation classes with elements of martial arts

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Abstract

Objective of the study was to take into account and evaluate the indicators of the functional state of men aged 40-60 years, leading a sedentary lifestyle, in the process of physical education and recreation classes with elements of martial arts.

Methods and structure of the study. The method of cardiointervalometry was used to monitor the functional state. The experiment involved 60 men aged 40-60 years (48.07±6.22), who were divided into experimental (EG) and control (CG) groups of 30 people. The EG attended physical culture and health-improving classes with elements of martial arts. Representatives of the CG were engaged in a different program, the basis of which was running in an aerobic mode.

Results and conclusions. At the end of the one-year experiment, significant differences were revealed in 13 out of 15 HRV parameters of men from the EG and one parameter of HRV in representatives of the CG ($p<0.05$; $p<0.01$). The analysis of intergroup differences in HRV indicators after the experiment showed that in men from the EG, compared with the representatives of the CG, 10 of the 15 studied parameters changed significantly. Special attention should be paid to such an indicator of HRV as the Stress Index (SI), which differs significantly between groups, the difference was 131.55% ($p<0.01$). The most pronounced changes affected the indicator of the activity of regulatory systems, the difference in the average parameters for the group was 155.7% ($p<0.01$). Thus, the positive effect of physical culture and health-improving activities with elements of martial arts on the cardiovascular system of men aged 40–60 years who lead a sedentary lifestyle was determined.

Keywords: *functional state, heart rate variability, physical culture and health-improving classes, martial arts, pedagogical experiment.*

Introduction. Issues related to maintaining the health of the population are of significant socio-economic importance for the state. In particular, the category of people aged 40-60 years, which is able-bodied, active and at the same time experienced, is of particular interest to scientists from the standpoint of increasing the functional capabilities of the body, the level of health, prolonging working capacity and working capacity [1, 2, 4, 5]. Physical inactivity is the fourth leading risk factor for global mortality, accounting for 6% of global mortality. According to data provided by WHO, most men in the second period of adulthood, starting from the age of 40, are overweight and obese [8]. This phenomenon is directly related to the lifestyle of men of this age period, which is characterized by physical inactivity, bad habits (smoking, alcohol consumption), poor nutrition, and stress [3, 6, 7, etc.].

Objective of the study was to take into account and evaluate the indicators of the functional state of men aged 40-60 years, leading a sedentary lifestyle, in the process of physical education and recreation classes with elements of martial arts.

Methods and structure of the study. The method of cardiointervalometry was used to monitor the functional state. The control of trainees included monitoring of the functional state, which allows to reveal the predominance of the type of vegetative regulation of the heart rate, the state of regulatory systems, the stress index, indicators of the psycho-emotional state and a number of other parameters, as well as a comprehensive indicator of the functional state, characterizing the activity of the cardiovascular, autonomic nervous systems.

The experiment involved 60 men aged 40-60 years (48.07±6.22), who were divided into experimental and control groups of 30 people. The subjects gave their written consent to the examination, and they also had no contraindications to attend physical education and health classes. Classes were held five times a week under the guidance of a qualified instructor. Each session lasted 90 minutes. The men of the experimental group attended physical culture and health-improving classes with elements of martial arts. It includes classes with Muay Thai elements, including shock and defensive technical actions that made up the aerobic block, exercises for developing the strength of individual muscle groups that are included in the power block, as well as exercises aimed at accelerating recovery processes, reducing psycho-emotional stress “18 forms tai chi qigong”, meditation, exercises to increase joint mobility, elasticity of ligaments. Representatives of the control group were engaged in a different program, the basis of which was running in an aerobic mode.

Results of the study and their discussion. The first examination of the functional state in terms of HRV in men did not reveal significant differences between 15 HRV indicators in the representatives of the experimental and control groups ($p>0.05$) (Table 1).

At the end of the one-year experiment, significant differences were found in 13 out of 15 HRV parameters of men in the experimental group and one parameter of HRV in the control group ($p<0.05$; $p<0.01$). The most pronounced changes in HRV parameters in the experimental group affected five spectral indicators: TP, LF, HF, VLF, LF/HF and two statistical indicators: SI, indicator of activity of regulatory systems (IARS). They significantly differ from the original data ($p<0.05$; $p<0.01$). On average, the group showed a significant decrease in humoral-metabolic effects on the regulation of heart rate, which occurred due to a decrease in the VLF index. After a year-long experiment in men, on average in the group, pronounced sympathotonia was replaced by a moderate predominance of the sympathotonic type of heart rhythm regulation. Significantly increased indicators such as total spectrum power (TP) - the increase was 54.6% of the original data, LF - 119.9%, HF - 191.8% ($p<0.01$). A statistically significant decrease in the SI index was noted, which, on average for the group at the end of the experiment, decreased by 61.4% ($p<0.01$). The IARS indicator also significantly decreased, the difference amounted to 2.03 r.u. ($p<0.01$).

An analysis of intergroup differences in HRV indicators showed that in men from the EG, compared with the representatives of the CG, 10 of the 15 studied HRV parameters changed significantly (Table 2).

Table 1. *Changes in heart rate variability in men aged 40–60 who lead a sedentary lifestyle*

Parameter	Statistic $\bar{X}\pm\sigma$			
	Experimental group (n=30)		Control group (n=30)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
HR, bpm $^{-1}$	72,71±7,53	65,10±4,33*	70,88±6,56	70,12±5,47
SDNN, ms	38,00±12,42	44,27±6,15*	39,21±15,23	39,88±4,12
RMSSD, ms	26,08±16,55	28,10±10,58	25,34±14,55	26,22±6,78
PNN50, %	47,56±5,11	48,47±4,38	47,34±6,77	47,22±10,13
Mo, s	633,17±15,36	738,44±11,16*	658,28±24,67	672,45±12,44
AMo, %	38,34±6,25	32,36±4,44*	36,88±6,33	36,14±6,44
SI, o.e.	264,42±57,23	102,00±26,20**	258,66±48,78	236,18±23648
TP, ms^2	1479,25±1189,2	2286,65±814,34**	1491,87±989,4	1461,87±433,22
LF, ms^2	434,45±112,45	955,22±110,25**	488,32±104,46	510,20±88,56
HF, ms^2	249,33±65,35	727,55±110,84**	257,37±57,88	337,44±48,10
VLF, ms^2	795,37±98,21	603,88±111,12*	746,37±101,12	646,16±102,44*
%LF, %	63,13±10,67	57,12±12,12*	65,51±8,67	64,14±20,20
%HF, %	36,84±11,23	42,88±10,66*	34,44±10,44	35,86±10,68
LF/HF	2,24±0,46	1,39±0,45*	1,90±0,37	1,79±1,24
IARS, point	3,23±1,68	1,2±0,36**	3,32±0,78	3,12±1,21

Note: ** – $p<0.05$; ** – $p<0.01$.*

Table 2. *Indicators of heart rate variability in men aged 40–60 years, leading a sedentary lifestyle, after the experiment*

Parameter	Statistic $\bar{X} \pm \sigma$		
	Experimental group (n=30)	Control group (n=30)	Values of differences
HR, bpm $^{-1}$	65,10±4,33	71,12±5,47	-6,02*
SDNN, ms	44,27±6,15	39,88±4,12	4,22
RMSSD, ms	28,10±10,58	26,22±6,78	1,88
PNN50, %	48,47±4,38	47,22±10,13	1,25
Mo, c	738,44±11,16	672,45±12,44	65,99
AMo, %	32,36±4,44	36,14±6,44	-3,78*
SI, o.e.	102,00±26,20	236,18±23,48	-134,18**
TP, ms^2	2286,65±814,34	1461.87±433,22	824,87**
LF, ms^2	955,22±110,25	510,20±88,56	445,02**
HF, ms^2	727,55±110,84	337,44±48,10	390,06*
VLF, ms^2	603,88±111,12	646,16±102,44	-42,28
%LF, %	57,12±12,12	64,14±20,20	-7,02*
%HF, %	42,88±10,66	35,86±10,68	7,02*
LF/HF	1,39±0,45	1,79±1,24	-0,40*
IARS, point	1,22±0,36	3,12±1,21	-1,90**

Note: ** – p<0,05, ** – p<0,01.*

The indicator of the total spectrum power (TP) after the experiment increased in men from the EG by 93.6% (p<0.01) and, on average for the group, corresponds to the norm, the optimal level of functioning. In turn, this HRV spectral indicator in CG men was below 200 ms2, which indicates a decrease in body resources. Differences between the mean HF values in the EG and CG were 53.6% (p<0.01). Special attention deserves such an HRV indicator as SI, which differs significantly between groups, the difference was 131.55% (p<0.01).

It should be noted that the regular performance of physical activity in health-improving classes with elements of martial arts made it possible to reduce the mental stress of men whose professional activity is intellectual work, accompanied by a constant significant impact on the central nervous system, stress, and mental stress. In men from the CG, positive dynamics was also noted, but not as pronounced as in the representatives of the EG. Regarding the components of the functional state, the CG showed positive dynamics, but no significant differences were found.

Conclusions. The positive influence of physical culture and health-improving classes with elements of martial arts on the cardiovascular system of men aged 40–60 years, leading a sedentary lifestyle, characterized by overweight and obesity, in whom the optimization of the tension of regulatory systems, a decrease in humoral and metabolic effects on the regulation of heart rhythm, a decrease in indicator SI, which also indicates the economization of the activity of the heart.

An analysis of the complex indicators of the functional state of men aged 40–60 allowed us to state that the representatives of the EG showed positive changes, since they were absent in the men of the CG. Positive changes were also noted in the components of the functional state in men from the EG - the regulation of heart rate, the state of the myocardium, and the psycho-emotional state.

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