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EFFECT OF THE TECHNIQUES OF KARATE ON FUNCTIONAL STATUS AND PHYSICAL FITNESS OF STUDENTS OF FLIGHT ACADEMY

Abstract. Purpose: to investigate the effect of the application of the techniques of karate on functional status and physical fitness of students of Flight Academy first year. **Material and Methods:** the study involved students of Flight Academy EG (pilots, $n=25$) and CG (rescuers, $n=23$). We determined the effect of the techniques of karate in physical fitness, running the 100 meters, bending and unbending hands ups, pull-ups on the bar, running 3,000 meters, 10 revolutions per gymnastic wheel; on functional status, body length, body weight, heart rate at rest, vital capacity, vital index ($\text{ml}\cdot\text{kg}^{-1}$) sample and test Stange and Ghencea. **Results:** revealed that the use of uniform and alternating load of running helped improve the outcome for 3000 m run and function of the respiratory system. Anaerobic subject to the techniques of karate contributed to increasing resistance to hypoxia. **Conclusions:** this study suggests the need to improve physical fitness of students by implementing motor activity of certain sports.

Keywords: physical training, functional status, vital capacity, vital index.

Introduction. Vocational training of cadets of flight educational institutions is the main factor of the quality of control of aircraft, ensuring the reliability of flight business. Physical preparation is an important factor in the improvement of the level of health and special efficiency of representatives of flight personnel. However physical exercises will promote the greatest effect at a combination of the general physical and applied physical preparation.

At the same time the analysis of a condition of the organization of physical preparation at a stage of the professional formation [7] revealed a variety of reasons which reduce its efficiency: the low level of physical development and physical fitness of graduates of high schools, the inefficiency of the real system of physical training of cadets, its uniformity and not versatility [1; 2; 4].

It is established that the optimum motive mode providing the introduction of a complex of various forms of physical training is a necessary condition of special physical fitness of cadets [7; 5].

It is proved that an orientation of cadets to systematic classes on physical exercises forms the need to resolve the system of physical preparation by elements of different types of sport. As a result of the carried-out questioning it is established that the most popular sport among cadets of the flight academy is karate which elements are suggested to be entered into the system of physical preparation.

Data about the inclusion in the system of physical training of cadets of flight educational institutions of elements of sports exercises aren't revealed in available special scientific and methodical literature that was a subject of our researches.

Communication of the research with scientific programs, plans, subjects.

The research is executed according to a subject of the Consolidating plan of the research work in the sphere of physical culture and sport for 2011-2015 of the Ministry of family, youth and sport of Ukraine within the subject "Theoretic-methodological bases of creation of the system of mass control and assessment of the level of the development and physical fitness of various groups of the population" (the number of the state registration is 0111U000192).

The objective of the research – is to develop a technique of the formation of elements of technology of karate and to define its influence on a functional condition of cadets of the flight academy.

Materials and methods of the research. Cadets of the flight academy of the first course took part in the researches: pilots (EG, n=25) and lifeguards (CG, n=23). The control group was engaged according to the approved program, and for pilots of EG elements of technique and certain exercises of special physical training of karatekas took root into this program.

In the research *such methods of research* were applied: the analysis and the generalization of special scientific and methodical literature, pedagogical testing (run on 100 m, pulling up on a crossbeam, bending and extension of hands in an emphasis, run on 3000 m and 10 turns in a gym roller), methods of definition of a functional state (VCL, HR, minute volume of breath, tests of Gench and Stange), methods of mathematical statistics.

Results of the research and their discussion. Materials of the research of many authors testify that functional activity of systems of an organism considerably increases at the rational development of physical qualities [9–11].

Materials of physical fitness of cadets of the flight academy of the first year of training are presented in the tab. 1.

It is already proved that the formation of movement skills and the development of special physical qualities are based on the increase of the general physical working capacity [3; 5; 6; 8].

Run on endurance, as a working capacity of the increase basis is applied for this purpose in many sports.

Running loadings of continuous character from 30 to 40 minutes at intensity of HR 155-160 bpm⁻¹ were applied in the experimental group. Besides, variable run was used on pieces of 200-300 m. The number of repetitions and intervals of rest defined individually. Only continuous running loadings were applied in the control group. The total amount of running loadings was identical in both groups.

The conducted researches showed that the combination of continuous running loadings to variables promoted the reliable improvement of result of run on 3000 m.

The tendency of the improvement of result of run on 3000 m is observed in the control group, however these changes aren't reliable.

Introduction of elements of technology of karate in classes promoted the increase of the level of high-speed and power qualities. Specifics of the performance

of elements of karate consist in the performance of movements with the maximum speed. It promotes the increase in speed of reaction and frequency of movements in unit of time. The improvement of result of run on 100 m was the result of the performance of elements of karate.

The performance of the standard exercises in the control group promoted only a tendency of the improvement of the result of run on 100 m.

Results of power endurance are provided at cadets-pilots as indicators of power preparedness: pulling up on a crossbeam and bending and extension of hands in an emphasis.

Results of the research testify that the reliable improvement of power manifestations is observed in both groups. However in the experimental group indicators improved on 18,75 and 55,5%, and in the control – on 12,92 and 41,1%.

It is proved that the level of vestibular stability is a basis in the improvement of technology of management of aircraft. The test offered by the State program – 10 turns in a gym roller –objectively reflects the level of vestibular stability for the smallest time.

The performance of various jumps with rotation in elements of technology of karate promoted the reliable improvement of test for vestibular stability. The improvement of the result made 23,53% in the experimental group. The tendency of increase of the level of result of vestibular stability made 10,77% that isn't the reliable improvement ($p > 0,05$).

The morphofunctional state changed more mainly in the experimental group (tab. 2).

The researches testify that body length has no reliable changes in both groups. However body weight has the reliable decrease (5,34%). The tendency of the decrease of body weight is observed and in the control group (1,4%) at $p < 0,05$.

The reduction of body weight amplifies at the expense of running loading in the experimental group which had both an aerobic, and an anaerobic orientation.

One of the informative indicators is HR the level of a state of which defines a condition of physical working capacity. Delay of HR at rest testifies to economization of a blood circulation function.

The indicator of function of breath is VCL. Its significant increase is observed in the experimental group that provides a necessary ventilation of lungs at physical activities. The increase in VCL occurs at the expense of running loadings of uniform and variable character in the experimental group and also because the elements of technology of karate are carried out at the constant deficiency of pulmonary ventilation that finally causes the activation of functional reserves.

The results of the research testify that the vital index (VCL relation to a body weight) rises with the increase in VCL and the decrease in a body weight. The increase of such ratio proves about the rationalization of introduction of a technique of the application of elements of karate in the process of physical preparation as the physical working capacity increases. The reliable changes of indicators of a vital index aren't observed in the control group.

Table 1

Indicators of physical fitness of cadets of the first year of training

Indicators	Experimental group (n=23)					Control group (n=27)						
	At the beginning		At the end		t	p	At the beginning		At the end		t	p
	\bar{X}	m	\bar{X}	m			\bar{X}	m	\bar{X}	m		
Run of 100 m (s)	14,20	0,07	13,60	0,12	4,61	<0,01	14,30	0,19	13,9	0,44	1,21	>0,05
Bending and extension of hands in an emphasis (quantity)	32,00	0,53	38,00	0,45	3,53	<0,01	31,85	0,53	35,50	0,45	2,82	<0,05
Pulling up on a crossbeam (quantity)	9,00	0,12	14,00	0,41	4,08	<0,01	8,50	0,17	12,20	0,44	4,33	<0,01
Run of 3000 m (min)	14,40	0,17	13,50	0,45	2,73	<0,05	14,44	0,19	14,15	0,47	1,18	>0,05
10 turns in a gym roller	17,00	0,18	13,00	0,24	4,26	<0,01	17,30	0,49	15,17	0,48	1,58	>0,05

Table 2

Indicators of a functional condition of cadets of the first year of training

Indicators	Experimental group (n=23)					Control group (n=27)						
	At the beginning		At the end		t	p	At the beginning		At the end		t	p
	\bar{X}	m	\bar{X}	m			\bar{X}	m	\bar{X}	m		
Body length (sm)	171,20	1,72	173,80	0,96	1,09	>0,05	172,13	0,78	173,95	1,17	0,96	>0,05
Body weight (kg)	75,72	0,83	71,7	0,78	3,55	<0,05	74,68	0,83	73,2	0,58	1,33	>0,05
Rest HR(quantity)	69,72	0,73	62,8	0,87	2,44	<0,05	69,56	0,37	68,13	0,45	2,08	>0,05
VCL (l)	3,76	0,09	4,87	0,17	7,44	<0,001	3,78	0,96	3,98	0,17	0,46	>0,05
Vital index (ml · kg ⁻¹)	52,29	0,72	59,55	0,36	3,39	<0,01	50,61	1,36	57,81	1,11	2,52	<0,05
Test of Stange (s)	49,70	0,18	53,75	0,27	6,36	<0,01	44,15	0,72	48,68	0,65	2,98	<0,05
Test of Gench (s)	27,15	0,12	32,27	0,27	5,32	<0,01	26,93	0,74	28,38	0,45	1,43	>0,05

The application of elements of karate in physical training of cadets of the flight academy assisted to the increase of the resistance to a hypoxia. So, the indicators of the test of Stange increased in the experimental group on 14,28% ($p < 0,01$), and the test of Gench on 19,50% ($p < 0,001$). The indicators of the test of Stange increased on 10,60% ($p < 0,05$), and the indicators of the test of Gench didn't reach the reliable changes ($p > 0,05$) in the control group.

Thus, the introduction in the process of physical preparation of elements of technology of karate promoted the substantial increase of physical fitness and the functional level of systems of an organism.

Conclusions:

1. The introduction of elements of technology of karate in studies on physical training of cadets of the flight academy promoted the increase of a level of the development of physical qualities that was a basis of the increase of functionality.

2. The combination of continuous methods of the development of endurance in combination with variable loadings provided the mobilization of reserve opportunities of an organism of examinees and the increase of the level of recovery processes.

The development of programs of health developing technologies by elements of single combats taking into account the specific psychophysiological features of the engaged can be **the prospect of further researches**.

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