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## **Methodology of cadets' physical qualities complex development at a military Institute of National Guard forces on the basis of organism energy-supply systems**

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**Abstract:** Physical culture is important for the cadets of military Institutes. It is conditioned by high level of demand claimed on cadets' physical fitness for the future official-tactical functions realization. **Materials.** We studied the ways of physical development improvement among the cadets in terms of physical training planning block "Sports-mass work" realization. **Research methods:** scientific and methodical information sources analysis and summarizing, pedagogical experiment, physical readiness testing; method of multiple-factor express-diagnostics of functional and reserve capacities of an organism "D&K-Test" by professor S.A. Dushanin [4], methods of mathematical statistics. **Results.** We created the experimental methodology of physical qualities (strength, quickness and endurance) complex development among the cadets of National Guard forces military Institute on the basis of organism energy-supply systems for the block of physical training planning "Sports-mass work". The effectiveness of the experimental methodology was estimated by means of the received testing results analysis in the end of the pedagogical experiment: respiratory system indices, functional and reserve capacities of an organism, physical fitness of the 2nd course cadets at a military Institute of National Guard forces in the control and experimental groups. The load, which was selected in accordance with the systems of energy supply for the cadets from the experimental group, provided positive reaction of respiratory system. The indices of functional and reserve capacities of an organism and the results of physical readiness norms fulfillment also improved. **Conclusion.** Created by us experimental methodology of physical qualities complex development by means of a circular training, taking into account the systems of energy supply, among the cadets of the 2nd course of a military Institute of National Guard forces in terms of physical training planning block "Sport-mass work" is effective.

**Keywords:** cadets, express-diagnostics D&K test by professor S.A. Dushanin, physical training, military Institute.

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### **Introduction**

Physical culture is important for the cadets of military Institutes. It is conditioned by high level of demand claimed on cadets' physical fitness for the future official-tactical functions realization, especially in terms of the Russian Federation special military operation on the territory of the Ukraine.

A.M. Fofanov and V.N. Kovalenko underline the

following in their research work: every collective of cadets has its own percentage of people with a low level of physical readiness [11,12]. The increasing each year percentage of the applicants, who enter the National Guard of the Russian Federation higher education establishments and have health problems and low physical qualities (strength, quickness, endurance) indices, leads to the fact

that the level of physical readiness among young men doesn't correspond with program demands [6]. Some scientists underline low level of physical readiness among the cadets of military Institutes and the indices of their physical readiness decrease by the graduation [1]. We found considerable amount of research works, directed toward the ways of physical readiness increase among cadets. For example, A.A. Konik and other authors offer arm wrestling means and methods in educational-training process of cadets [5], D.A. Dubrovin and other authors offer exercises with weight in physical training of cadets [3]. We also found the works connected with physical load planning on the basis of the load differentiation taking into account energy supply systems of an organism. N.B. Mayamsin creates the methodology of strength and endurance development among the cadets of a military higher education establishment. They study "logistical and administrative support" specialty, taking into account their bioenergetic types [7]. A.A. Smirnov studies the complex of highly-intensive exercises use during the independent lessons on the basis of energy supply systems [9]. A.S. Torkhov together with other authors studies the question of physical qualities complex development taking into account bioenergetic types of students at medical academy [10]. In spite of great amount of research works, which are connected with cadets' physical qualities development and directed toward their physical readiness improvement, in our opinion, the question of physical qualities complex development among the cadets of National Guard forces military Institute on the basis of organism energy supply systems is still not studied enough.

The aim of the research is to create and experimentally substantiate the effectiveness of the physical qualities methodology complex development by means of a circular training among the 2nd course students of National Guard forces military Institute on the basis of organism energy supply systems.

The objectives of the research:

1. To define the systems of organism energy supply among the cadets of a military Institute of National Guard forces.
2. To create and substantiate the methodology of a complex physical qualities development by means of circular training method among the cadets of a military Institute of National Guard forces on the basis of organism energy supply systems.

### **Materials and methods**

The following research methods were used: information sources analysis concerning the problem of the research; pedagogical experiment; methods of mathematical-statistical handling of the received results; physical readiness testing; method

of multiple-factor express-diagnostics of functional and reserve capacities of an organism "D&K-Test" by professor S.A. Dushanin [4]; method of statistical significance of mean values differences determination according to Student's test.

In order to define the systems of organism energy supply we used the methodology of express-diagnostics "D&K-Test". It reveals functional and reserve capacities of an organism, defining 5 bioenergetic profiles of the respondents. This methodology is offered by professor S.A. Dushanin. The first group of cadets included people, with ANAMC (1-11%) and AMC (89-99%); the second group included the cadets with ANAMC (12-20%) and AMC (80-88%); the third group included the cadets with ANAMC (21-29%) and AMC (71-79%); the 4th group included people with ANAMC (30-38%) and AMC (62-70%); the 5th group included people with ANAMC (39-83%) and AMC (17-61%). Taking all mentioned above into consideration we included the cadets from the 1st and the 2nd bioenergetic profile into the group of aerobic type (11 cadets in the control group, 12 cadets in the experimental group), cadets of the 3rd bioenergetic profile were included into the group of the mixed type (9 cadets in the control group, 8 cadets in the experimental group); cadets of the 4th and the 5th bioenergetic profile were included into the group of anaerobic type (3 cadets in the control group and 5 cadets in the experimental group). This classification is offered by professor Gibadullin I.G. and other authors [2].

We created the experimental methodology of a complex physical qualities development (strength, quickness and endurance) among the cadets of military Institute of National Guard forces on the basis of organism energy supply systems for the block of planning physical training – sport-mass work.

48 cadets of the 2nd course at military Institute of National Guard forces took part in the experiment. They were divided into two groups: control group – 23 cadets and experimental group – 25 cadets. The lessons were held under the control of troop commander three times a week 60 minutes each in both groups in accordance with the plan of the physical training block "Sport-mass work". The lessons in the control group were held according to Federal State Educational Standards 3+. In the experimental group the load was differentiated according to physical qualities (strength, quickness, endurance) depending on the system of organism energy supply. The lessons were organized with the help of circular training method. Table 1 presents the load distribution for the experimental group depending on the system of organism energy supply.

Table 1

The load distribution depending on the system of cadets' organism energy supply, %

№	S y s t e m s of organism energy supply	Strength	Quickness	Endurance	Total
1	Aerobic	45	35	20	100
2	Mixed	33	33	34	100
3	Anaerobic	35	20	45	100

During the 1st and the 2nd lesson in the semester in order to define the loads of the selected exercises in a circular training we organized maximal test within 1 minute (MT)- the selected exercise was fulfilled by the cadets maximally possible amount of times within 1 minute. MT was realized after getting acquainted with the exercise. It means that cadets had a trial fulfillment, during which they paid attention to correctness of the exercise fulfillment and safety technique. The amount of repetitions in the exercise was registered. The calculation was the following:  $load = MT/2$  [8]. The received amount of repetitions in the exercise without correction was used for the subgroup of a mixed type and was corrected for the subgroups of aerobic and anaerobic types of organism energy supply. Correction was held in accordance with the load distribution, presented by table 1. It means that for the subgroup of aerobic type the load was increased in the exercises for strength and quickness development and decreased in the exercises for endurance development. For the subgroup of anaerobic type the load was increased in the exercises for strength and endurance development and the amount of repetitions in the exercises for quickness development was decreased. Thus, the load was differentiated in accordance with cadets' organism energy supply system. Complexes of exercises selection, the experiment and norms for the cadets of Military Educational Establishments of Higher Education (MEEHE) in physical training were held during the term. The cadets of the

experimental group were divided into 4 subgroups in accordance with their system of energy supply: subgroup with aerobic system of energy supply 1 and 2 – 6 cadets each, subgroup with the mixed system of organism energy supply – 8 cadets, subgroup with anaerobic system of organism energy supply – 5 cadets. For each subgroup we formed the file. It included the following: 1) scheme of moving from station to station of the circular training; 2) the list of cadets with the amount of exercise repetitions taking into account the system of organism energy supply. The exercises were fulfilled by the cadets in accordance with the scheme of moving within 3 circles. In order to preserve the intensity of the load after the 4 weeks of the lessons we selected a new complex of exercises.

#### Results and discussion

The effectiveness of the physical qualities development methodology among the cadets of National Guard forces military Institute on the basis of the organism energy supply system was estimated according to the changing indices of the respiratory system, functional and reserve capacities of an organism and physical readiness norms fulfillment in the end of the experiment. For this purpose we registered mentioned above indices at the beginning and in the end of the pedagogical experiment in the control and the experimental groups.

Table 2 presents the results of testing respiratory system.

Table 2

The results of testing respiratory system among the cadets of the 2nd course from the control and the experimental groups before and after the experiment

Respiratory system indices		Stages	Control group			Experimental group		
			X ± σ	in %	p	X ± σ	in %	p
VC, l	Pre#1	before	4,55±1,32	3,30%	>0,05	4,13±0,88	21,79%	<0,05
		after	4,7±0,89			5,01±0,59		
	%Pred.	before	89,68±14,02	7,77%	<0,05	93,04±12,35	15,87%	<0,05
		after	96,65±12,49			107,81±11,08		
FVC, l	Pre#1	before	3,57±2,82	5,60%	<0,05	3,82±1,11	14,92%	<0,05
		after	3,77±1,91			4,39±0,83		
	%Pred.	before	79,12±15,08	5,75%	>0,05	83,44±13,89	17,67%	<0,05
		after	83,67±14,12			98,18±14,01		
FIV, l	Pre#1	before	3,41±1,55	13,20%	<0,05	3,21±1,09	34,27%	<0,05
		after	3,86±1,12			4,31±0,78		
	%Pred.	before	91,85±15,97	4,50%	<0,05	96,48±16,65	8,28%	<0,05
		after	95,98±14,01			104,47±11,49		
MVV, l/m	Pre#1	before	145,2±41,57	13,63%	<0,05	144,9±38,74	15,49%	<0,05
		after	164,99±37,49			167,34±32,35		
	%Pred.	before	104,49±17,41	7,93%	<0,05	111,8±15,99	6,63%	<0,05
		after	112,78±15,56			119,21±12,10		
EVC, l	Pre#1	before	4,55±2,36	3,30%	>0,05	4,13±1,01	21,79%	<0,05
		after	4,7±1,47			5,03±0,69		
	%Pred.	before	87,98±14,09	2,34%	>0,05	93,04±12,35	8,70%	<0,05
		after	90,04±11,42			101,13±9,67		

The held experiment and the received respiratory system indices analysis in the control and experimental groups of the 2nd course cadets of National Guard forces military Institute showed positive dynamics of the considered indices. In the experimental group we see more significant indices increase in comparison with the control

group. At the same time, all compared values have statistically valid character. In the control group in 4 out of 10 studied indices the compared values have statistically not valid character ( $p < 0,05$ ).

Let's consider the results of functional and reserve capacities of an organism testing (table 3).

Table 3

The results of testing functional and reserve capacities of an organism among the 2nd course cadets from the control and the experimental groups before and after the experiment

Indices of functional and reserve capacities of an organism	Stages	Control group			Experimental group		
		X ± σ	in %	p	X ± σ	in %	p
GMC (general metabolic capacity), c.u.	before	286,33±39,59	0,72%	>0,05	294,67±40,49	3,53%	<0,05
	after	288,4±40,7			305,08±38,47		
PCP (power of creatine phosphate source of energy supply), c.u.	before	31,4±6,03	6,08%	<0,05	31,5±5,75	8,67%	<0,05
	after	33,31±5,98			34,23±4,89		
PGL (power of glycolytic source of energy supply), c.u.	before	31,45±3,55	2,70%	<0,05	31,42±2,94	12,29%	<0,05
	after	32,3±3,28			35,28±2,09		
PASES (power of aerobic source of energy supply), c.u.	before	63,32±6,13	0,99%	<0,05	64,08±5,29	3,21%	<0,05
	after	63,95±5,93			66,14±4,78		
HRtanm (heart rate on threshold of anaerobic metabolism), c.u.	before	164,04±7,43	0,26%	>0,05	163,84±6,75	1,52%	<0,05
	after	164,47±6,84			166,33±5,39		
dGMC, c.u.	before	196,17±10,06	1,10%	<0,05	195,25±9,75	2,71%	<0,05

After the pedagogical experiment using the experimental methodology of a complex physical qualities development by means of circular training method among the 2nd course cadets of a military Institute of National Guard forces on the basis of organism energy supply systems we saw higher results increase in the experimental group, than in the control group. At the same time, all compared values have statistically valid differences ( $p < 0,05$ ) in the experimental group. In the control group in two exercises (№ 51 – 100 m running and № 56 – 3 km running) the compared values have statistically insignificant differences ( $p > 0,05$ ).

### Conclusion

The load, which was selected in accordance with

the systems of energy supply for the cadets from the experimental group, provided positive reaction of respiratory system. The indices of the functional and reserve capacities of an organism and the results of physical readiness norms fulfillment also improved. The studied indices increase turned out to be more significant in the experimental group and all compared values have statistically valid differences ( $p < 0,05$ ) in contrast to the control group, where the range of the compared indices are statistically invalid ( $p > 0,05$ ). The received results prove that during the load planning among the cadets from the control group we didn't take into account their systems of organism energy supply. Thus, we can state that the created by us experimental methodology of a complex physical

qualities development by means of circular training, taking into consideration organism energy supply systems among the cadets of the 2nd course at a military Institute of National Guard forces in terms of the block of physical training planning "Sport-mass work" is effective.

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