PHYSICAL EXAMINATION PERFORMED BY THE INTERNATIONAL MILITARY OPERATIONS IN MOUNTAINOUS TERRAIN

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Annotation. *Purpose*: test the author's program of physical training in order to adapt the Armed Forces of Ukraine to the military profession in international operations in various climatic conditions. *Material*: the study involved 67 military first age group - employees under contract. Analyzed growth performance, body weight, lung capacity, sample Stange, carpal dynamometry, heart rate at rest, systolic and diastolic blood pressure recovery time heart rate to baseline after 20 sit-ups in 30 seconds, adaptive capacity, Quetelet index, Robinson, step test, physical condition, life and power indices. *Results*: the effect of physical training lessons the author's program on the physical condition of the peacekeepers, international activities which took place in the highlands. As a result, training peacekeepers marked stable operation of the cardiovascular system and respiratory system. This increases the stability of the organism to adverse environmental factors. *Conclusions*: the positive influence of employment on the program developed by the military on the body.
Keywords: soldier, environment, index operation, peacemaker, physical, preparation.

Introduction

Participation of military officers of Armed Forces of Ukraine in international missions requires high level of combat readiness from manpower. This is connected with the fact that in modern conditions effective application of combat machinery and weapon, no matter how modern they can be, depends on men, who control them, on their professional, psychological and physical readiness [2, 4, 11].

Researches [1, 3, 5, 9] showed that military-professional functioning of peace-makers of Armed Forces of Ukraine, who come to new locations for the first time, is accompanied by influencing of many negative environmental factors. Among them there are: high temperature of the air, reduced humidity, sun radiation in deserts; reduced atmospheric pressure, variation of day and night temperatures and specificities of relief in mountains; restricted space, low motion activity in such places as check points, inhabited localities, combat machinery [1, 6, 8, 10].

Organisms of most of peace makers, who come in new conditions of functioning, “pay high price” for adaptation [5-7, 12-16]. In our researches we determined that indicators of physical condition and somatic state of peace makers worsened in the process of international missions. The most expressed changes in indicators of cardio-vascular and respiratory systems were registered in peace makers, who functioned in mountains.

Thus, our researches showed that existing system of military officers’ physical training, especially those, who are involved in international operations, is not sufficiently effective for maintaining of proper morphological-functional state, somatic health and ensuring of international activity. Main reason of low effectiveness of mentioned indicators of peace makers is neglecting of peculiarities and climate-geographical conditions of future places of functioning by existing physical training program.

On the base of analysis of many scientists’ works (S. Romanchuk, Yu. Finogenov, V. Chaplygin et al.) and basing on our own researches, we worked out program of military officers’ adaptation to military-professional functioning in international missions with the help of physical training means, which imply timely formation of physical and mental fitness and functional abilities of peace makers organism’s systems, ensuring success and effectiveness of their military-professional functioning.

The work has been fulfilled as per plan of SRW of Physical training department of Administrative Center of training and everyday functioning of Armed Forces of Ukraine “Model of physical training in Armed Forces of Ukraine (2007) and its prospects”. Code – Prospect FP”.

Purpose, tasks of the work, material and methods

The purpose of the work is experimental testing of author’s program of adaptation of military officers of Armed Forces of Ukraine to military-professional functioning in international operations in different climate-geographical conditions with the help of physical training means.

For researching of author’s physical training program’s influence on peace makers’ physical condition we analyzed indicators of body length, body mass, vital capacity of lungs (VCL), Shtange’s test, hand dynamometry, Ketle’s index (IK), vital index (VI), heart beats rate in rest (HBR), systolic BP (SBP), diastolic BP (DBP), index of Robinson (IR), index of ste-test (IST), index of physical condition (IPC), time of HBR restoration up to initial level after 20 squatting during 30 seconds and adaptation potential (AP). For carrying out of experiment, contract military officers (of 24-28 years old age) were divided into two groups: experimental (EG) (n=34) and control (CG) (n=33). Testing of EG and CG peace makers’ physical condition was based on medical examinations before mission (initial data) and after operations (final data).

Results of the research

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Analysis of body length indicators of EG and CG military officers showed that mean values of both groups have no confident difference during all period of experiment (P>0.05) (see table 1). Analysis of body length's dynamic also showed that during all period of experiment indicators remained unchanged – no confident difference between initial and final data was registered (P>0.05) (see table 1).

Indicators of body mass of EG and CG peace makers had no confident difference at beginning of experiment (t=0.08; P>0.05) (see table 1). At the end of experiment we registered mass body of both groups' peace makers, but if in EG difference between initial and final data was 1.05kg (t=0.89, P>0.05), than in CG – 1.98 kg (t=1.58; P>0.05). After returning from mission difference in mass bodies of EG and CG peace makers was 0.83 kg, however it was unconfident (t=0.74, P>0.05) (see table 1).

Analysis indicators of mass body permits to come to conclusion that trainings according to developed experimental program ensures stabilization of body mass of EG peace makers during fulfillment of operations in mountains that witness about effectiveness of author's program in comparison with existing physical training of military officers, who were involved in international operations.

Table 1.

Level and dynamics of physical condition of peace makers, who fulfilled operations in mountains (EG and CG) during experiment

Stage of experiment	EG (n=34)			CG (n=33)			Confidence of difference	
	$\bar{X}$	σ	±m	$\bar{X}$	σ	±m	t	P
Body length (cm)								
Beginning	176.03	4.71	0.82	176.25	4.85	0.87	0.18	>0.05
End	176.13	4.69	0.82	176.33	4.82	0.88	0.16	>0.05
Body mass (kg)								
Beginning	72.93	4.98	0.87	73.03	5.38	0.97	0.08	>0.05
End	71.88	4.62	0.80	71.05	4.40	0.79	0.74	>0.05
Ketle's index (g.p.cm))								
Beginning	414.50	29.14	5.07	414.33	27.94	5.02	0.02	>0.05
End	408.39	27.22	4.74	402.92	22.25	4.01	0.87	>0.05
VCL (ml)								
Beginning	4276.47	472.20	82.20	4215.63	618.52	111.09	0.44	>0.05
End	4241.18	326.40	56.82	4081.25	285.28	51.28	2.08	<0.05
Vital index (m.p.kg)								
Beginning	58.88	7.50	1.30	57.83	8.59	1.54	0.51	>0.05
End	59.18	5.33	0.93	57.62	4.95	0.89	1.21	>0.05
Dynamometry of stronger hand (kg.p,sec)								
Beginning	47.85	5.50	0.96	47.41	4.51	0.81	0.35	>0.05
End	46.97	4.69	0.82	45.86	4.94	0.89	0.93	>0.05
Power index (%)								
Beginning	65.82	8.14	1.42	65.27	7.87	1.41	0.27	>0.05
End	65.55	7.40	1.29	64.70	7.41	1.33	0.46	>0.05

Notes. Statistically significant differences of mean values at the beginning and at the end of experiment: «*» - P<0.05; «**» - P<0.01; «***» - P<0.001.

Analysis of weight-height Ketle's index of EG and CG military officers showed that before pedagogic experiment there was no confident difference between mean values (t=0.02; P>0.05) (see table 1). After returning from mission difference was 5.47 g.p.cm, but was unconfident (t=0.87; P>0.05) (see table 1).

Dynamic of Ketle's index of EG and CG has character similar to dynamic of body mass – reducting of indicator in both groups; in EG final Ketle's index was (408.39 g.p.cm) lower that initial (414.50 g.p.cm) by 6.11 g,p.cm (t=0.88; P>0.05), while in CG – by 11.41 g.p.cm (t=1.78; P>0.05). Indicators of EG and CG Ketle's index corresponded to middle level "sufficient mass" both at the beginning and at the end of experiment.

Analysis of VCL at EG and CG showed that indicators, registered before mission had no confident difference (t=0.44; P>0.05). After mission mean VCL value of EG was confidently higher than of CG by 159.93 ml (t=2.08; P<0.05) (see table 1).

Analysis of VCL dynamic showed that its value at EG remained confidently stable during all experiment – difference between initial and final values was 35.29 ml (t=0.35; P>0.05). In CG indicators of VCL worsened by 134.38 ml (t=1.10; P>0.05) (see table 1).

Analysis of vital index of EG and CG permits to note that before and after experiment its value in both groups had no confident difference (P>0.05). Before mission difference between EG and CG indicators was 1.05 ml.p.kg (t=0.51; P>0.05), and after returning – 1.56 ml.p.kg (t=1.21; P>0.05) (table 1).

Indicators of vital index indicators of CG are of negative character and in EG – positive one. In CG VI indicator worsened by 0.62 ml.p.kg (t=0.12; P>0.05), while in EG it improved by 0.3 ml.p.kg (t=0.19; P>0.05) that witnesses about stable level of functional abilities of respiratory system of EG peace makers in process of mission's fulfillment in mountains and about positive influence of training by author's program. Level of reserves of external breathing functions is estimated as "middle" by values of vital index of EG and CG.

Dynamometry of stronger hand of EG and CG military officers showed that their values did not significantly differ before experiment (t=0.35; P>0.05) (see table 1). The end of experiment there was registered difference – EG peace makers' indicators of stronger hand was higher than at CG by 1.11 kg.p.sec., however, the difference is unconfident (t=0.93; P>0.05). Indicators of stronger hand muscles in both groups worsen during experiment and at the end they are lower than at the beginning: in EG by 0.88 kg.sec (t=0.70; P>0.05), in CG – by 1.55 kg.sec. (t=1.29; P>0.05) (see table 1).

Analysis of power index showed that these indicators at EG and CG both at the beginning and at the end of experiment did not confidently differ (P>0.05) (see table 1). During all period of international mission mean value of power index of EG military officers confidently did not change (t=0.14; P>0.05), while at CG it worsened by 0.57% (t=0.29; P>0.05).

With it, value of EG members' power index in the course of experiment was on middle level, while level of functions' reserve of CG members' muscular system was estimated at the beginning of experiment as "middle" and at the end – as "lower than middle".

Physical condition dynamic of peace makers, who fulfilled mission in mountains, showed that the tested indicators more expressively worsened in CG that witness about effectiveness of author's program.

Analysis of HBR in rest at EG and CG permits to note that initial data had no confident difference (t=0.62; P>0.05). At the end of the research difference between HBR indicators of EG and CG was 0.90 b.p.m., but it was unconfident (t=1.58; P>0.05) (see table 2).

Dynamic of HBR in the tested groups of peace makers was characterized by increasing of mean values of HBR in rest during experiment. For example, if in EG indicators, after returning from mission, worsened in comparison with initial data by 0.47 b.p.m. (t=0.74; P>0.05), than in CG – by 1.84 b.p.m. (t=2.60; P<0.05) (see table 2).

Analysis of BP indicators at EG and CG showed that at the beginning and at the end of experiment there was no confident difference between these indicators (P>0.05) (see table 2).

Analysis of BP indicators in both tested groups showed that mean values of SBP and DBP in EG and CG had trend for increasing. For example, at the end of experiment SBP indicators in EG were worse in comparison with initial data by 0,09 mm.merc.col. (t=0.08; P>0.05), while DBP indicators – by 0.88 mm.merc.col. (t=1.09; P>0.05). In CG difference between initial and final values of SBP and DBP was 1.72 mm.merc.col. (t=1.39; P>0.05) and 1.71 mm.merc.col. (t=1.54; P>0.05) accordingly (see table. 2).

Comparative analysis of Robinson's index, which characterizes reserves of cardio-vascular system's functional abilities at EG and CG showed that at the beginning of experiment there was no confident difference between indicators (t=0.28; P>0.05) (see table 2). At the end of experiment Robinson's index at EG was confidently better than the same at CG by 4.08 conv.un. (t=2.03; P<0.05) (see fig.1).

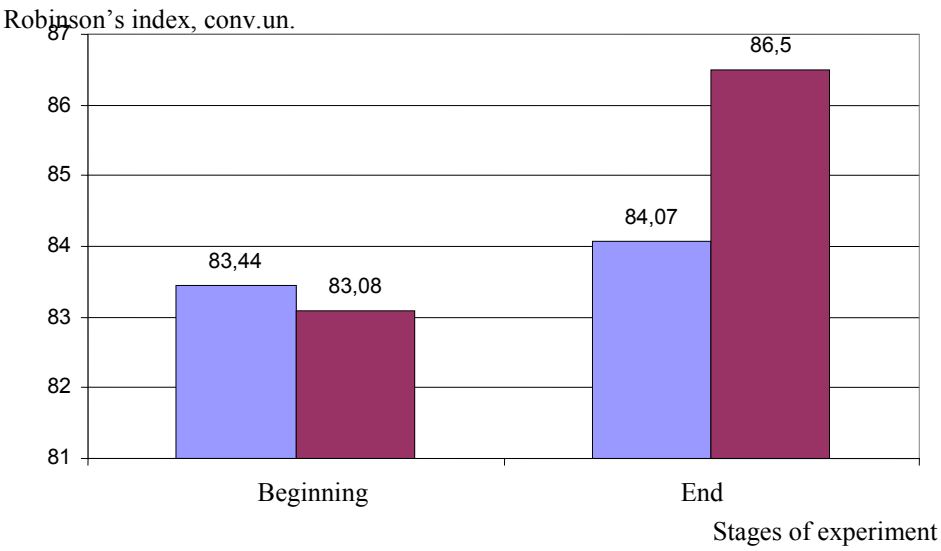

Fig.1. Dynamic of Robinson's index indicators of peace makers, who fulfilled mission in mountains (EG and CG) in the course of experiment (conv.un.)

– indicators of EG peace makers

– indicators of CG peace makers

Table 2.

Dynamic of functional state of peace makers, who fulfilled mission in mountains (EG and CG) in the course of experiment

Stage of experiment	EG (n=34)			CG (n=33)			Confidence of difference	
	X	σ	±m	X	σ	±m	t	P
HBR in rest (b.p.m.)								
Beginning	71.35	3.19	0.56	70.88	2.91	0.52	0.62	>0.05
End	71.82	1.74	0.30	72.72*	2.65	0.48	1.58	>0.05
Systolic BP (mm.merc.col.)								
Beginning	116.94	4.93	0.86	117.19	4.39	0.79	0.21	>0.05
End	117.03	4.10	0.71	118.91	5.31	0.95	1.57	>0.05
Diastolic BP (mm.merc.col.)								
Beginning	72.15	3.34	0.58	72.34	2.94	0.53	0.25	>0.05
End	73.03	3.20	0.56	74.05	5.46	0.98	1.47	>0.05
Robinson's index (conv.un.)								
Beginning	83.44	5.16	0.90	83.08	5.01	0.90	0.28	>0.05
End	84.07	3.90	0.68	86.50*	5.46	0.98	2.03	<0.05
Time of HBR restoration up to initial level (sec.)								
Beginning	87.85	14.23	2.48	88.03	9.81	1.76	0.06	>0.05
End	89.59	13.46	2.34	95.38**	8.57	1.54	2.06	<0.05
Index of step-test (conv.un.)								
Beginning	88.29	7.92	1.42	87.97	7.51	1.35	0.17	>0.05
End	87.50	7.15	1.29	83.94*	5.51	0.99	2.20	<0.05
Shtange's test (sec.)								
Beginning	54.41	8.80	1.58	53.94	8.28	1.49	0.22	>0.05
End	53.09	7.41	1.33	49.38*	5.97	1.07	2.17	<0.05

Index of physical condition (conv.un.)								
Beginning	0.708	0.034	0.006	0.711	0.036	0.007	0.29	>0.05
End	0.699	0.027	0.005	0.680**	0.032	0.006	2.46	<0.05
Adaptation potential (conv.un.)								
Beginning	2.17	0.10	0.02	2.16	0.09	0.02	0.05	>0.05
End	2.17	0.10	0.02	2.20	0.10	0.02	1.39	>0.05

Notes. Statistically significant differences of mean values at the beginning and at the end of experiment: «*» - P<0.05; «**» - P<0.01; «***» - P<0.001.

Analysis of Robinson's index dynamic of EG peace makers showed that training by author's program ensure stable work of cardio-vascular system of peace makers during all experiment; value of indicator unconfidently increased by 0.63 conv.un. (t=0,56; P>0.05). Increasing of this indicator means worsening of cardio-vascular system's functional abilities. Robinson's index of CG peace makers at the end of experiment confidently worsened in comparison with initial data by 3.42 conv.un. (t=2.57; P<0.05) (table 2, fig. 1). With it IR indicators in CG at the end of research correspond to middle level, while in EG they were "higher than middle".

Analysis of time of HBR restoration up to initial level after 20 squatting during 30 seconds of EG and CG peace makers witness that at the beginning of experiment indicators did not confidently differ (t=0.06; P>0.05). At the end of the research difference between EG and CG indicators was 5.79 sec. and became confident (t=2.06; P<0.05) (see table 2).

Analysis of dynamic of time of HBR restoration up to initial level permits to note worsening of this indicator in both groups during all experiment. But, if in EG difference between initial and final data was 1.74 sec. (t=0.51; P>0.05), than in CG it was 7.35 sec. (t=3.14; P<0.01) (see table 2).

Analysis of step-test index of EG and CG step-test index witnesses that before mission indicators of both groups did not differ (t=0.17; P>0.05). After mission step-test index of EG military officers became confidently higher than the same of CG group by 3.56 conv.un. (t=2.20; P<0.05) (see table 2).

Dynamic of step-test index in both groups of peace makers, who fulfilled mission in mountains, has trend to reduction. But if in EG this index remained practically unchanged (t=0.41; P>0.05), then in CG it confidently worsened by 4.03 conv.un. (t=2.41; P<0.05).

Analysis of time indicators of breathing pause after inhale showed that at the beginning of experiment Shtange's test of both groups' military officers were confidently equal (t=0.22; P>0.05). At the end of research time of breathing pause of EG members confidently exceeded the same indicator of CG by 3.71 sec, (t=2.17; P<0.05) (see table 2). Dynamic of Shtange's test's indicators in both groups had similar to previous indicators character: insufficient reducing of indicator in EG by 1.32 sec. (t=0.22; P>0.05) and confident worsening in G by 4.56 sec. (t=2.49; P<0.05) (see table 2).

The level of functional abilities of cardio-respiratory system of CG peace makers before mission was estimated as "good" and after returning – as "satisfactory". In EG during all experiment we registered good level of functional abilities by Shtange's test.

Analysis of physical condition index showed that its mean value in both groups of peace makers in both groups before mission did not confidently differ (t=0.29; P>0.05). At the end of experiment difference was 0.019 conv.un. and was confident (t=2.46; P<0.05) (see table 2).

Dynamic of physical condition's index had negative character during all experiment: indicators of EG at the end of the research were lower than initial data by 0.009 conv.un. (t=1.15; P>0.05). In CG mean value of physical condition's index confidently worsened by 0.031 conv.un. (t=3.36; P<0.01).

Analysis of indicators of adaptation potential of EG and CG members showed that at the beginning as well as at the end of experiment there was not registered any confident difference (t=0.05; t=1.39; P>0.05) (see table 2). AP values of EG peace makers did not change during the whole experiment, while in CG they worsened by 0.04 conv.un. (t=1.41; P>0.05) (see table 2).

Conclusions:

Analysis of effectiveness of author's program on improvement of peace makers' functional state permitted to determine positive influence of trainings by the worked out program on organism of experimental group's military officers (n=34). As a result of trainings of peace makers, who fulfilled international missions in mountains, we registered stable operation of cardio-vascular system and respiratory system that, in the whole, facilitates increasing of their organism's resistance to influence of unfavorable environmental factors.

Further researches imply foundation and development of programs of military officers' adaptation to military-professional functioning in international missions with the help of physical training of military officers of older age groups of different categories.

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