

CHARACTERISTICS OF PHYSICAL LOADS ENDURED BY MILITARY OFFICERS OF MECHANIZED TROOPS DURING FIELD MANEUVERS

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Abstract. *Purpose:* observation over influence of physical loads on military officers in process of acquiring and mastering of military applied skills during field maneuvers. *Material:* in experiment 120 military officers of 20-25 years old age with equal physical fitness participated. *Results:* it was determined that in period of field maneuvers the greatest load was endured by military officers in attack exercises and on the march. The least physical loads were in period of organization and fulfillment of combat shooting. It was also established that main part of motor actions was fulfilled in aerobic mode. Military officers' functioning in field maneuvers was accompanied by heart beats rate of 120-150 b.p.m. and 60-90 b.p.m. during long time. *Conclusions:* We offered to practice physical training of mechanized units' military officers in modes, close to field ones.

Key words: physical loads, military officers, heart beats rate, field maneuvers.

Introduction

Analysis of physical training system in Armed Forces of Ukraine shows that it is insufficient for ensuring of troops combat readiness. One of reasons is old means and technologies of military officers' physical training. Analysis of combat training's requirements to military officers' physical fitness points at demand in reformation and improvement of physical training system.

Recent years most of researches concerned level of military officers' physical fitness and its interconnection with results of combat readiness. L.A. Weiner-Dubrovin (1974), L.P. Popov (1984) studied organization of physical training; V.P. Leontyev (2000) carried out researches for determination of character of loads, endured by military officers of mechanized units; Yu.S. Finogenov (2003), O.I. Velychko (1990) researched structure of military professional actions; S.I. Glazunov (2003), V.M. Romanchuk (2006), S.V. Romanchuk (2013) studied dynamic of military officers' active actions and character of rest. Alongside with it, researches of main indicator of load's tension – heart beats rate (HBR) with palpation method of individual military officers at certain stages of trainings has not been practiced yet.

That is why there has been appeared a demand in researching of HBR dynamic as objective criterion of load's tension and value with modern objective methods.

Purpose, tasks of the work, material and methods

The purpose of the work is to determine characteristics of physical loads, endured by Land Forces mechanized troops' military officers during field maneuvers.

The tasks:

- Conduct timing of military officers' motor functioning during field maneuvers;
- Register HBR dynamic of military officers during fulfillment of military applied actions.

The methods of the research: analysis of literature, scientific and Internet sources, observation, medical-biological methods (pulse metering with system «Polar Team System»), method of mathematical statistic.

Organization of the research: as per idea of the research it was necessary to determine (with the help of system «Polar Team System») pulse value of different variants of military-professional actions (total quantity of HBR – heart beats rate of military officers during certain period of field maneuvers) In the research 120 military officers of 169 Training center of 20-25 years old age participated. The research was conducted during September 2012, with officers' dress code – field and ammunition of 30-40 kg weight.

Results of the research

Orientation of loads is one of main signs of physical loads' qualification (M.A. Godik, 1980). Its studying permits to understand requirements of training-combat functioning by qualitative character of military officers' motor actions.

The research of variability of alternation of different orientation's loads permits to receive materials, which can explain the reasons of weakening of military officers' professional workability in field marches. The received data can serve as a model for construction of trainings in organization of military officers' physical training.

Orientation of physical loads was studied by analyzing of motor actions' timing during 2 days' (48 hours) field marches in summer period with air temperature up to 30°. With it, we continuously registered HBR with "Polar Team System" of individual military officer. The received data were processed with the help of program Microsoft Excel – 2007. Mean HBR of military officers in rest was 60 b.p.m.

During 2 days' field maneuvers military officers of mechanized units fulfilled a number of tasks: preparing of arms and machinery (IFV) for moving, 50 km march on IFV, two ten kilometers' marches by foot in full military ammunition; tactic tasks during attacking of enemies positions; training-combat shooting from all kinds of arms. We calculated mean HBR for 1 minute, determined HBR changes during fulfillment of every combat task in respect to indicators in rest.

Motor actions of military officers during field maneuvers were conventionally divided into the following kinds (of professional-combat functioning):

1. Actions by training alarm signal.
2. Preparation of arms and machinery for march and shooting.
3. March on IFV with rest.
4. Functioning in the staging area.
5. Organization of defense and repelling of attack.
6. Actions in attack and capture of enemies object.
7. Combat shooting of company.
8. First march by foot.
9. Second march by foot.
10. Eating, rest sleeping, hygienic measures.

Actions by training alarm signal continued 90 minutes and were 3.1% of total time. Mean HBR was 95.4 b.p.m., relative pulse intensity (pulse increment in respect to rest state) was 58.3%. Analysis of pulse values distribution in this period witness that maximal HBR reached 145 b.p.m. (approximately 3% of total time).

Preparation of arms and machinery for march and shooting took 480 minutes (16.5%) of total time. Mean HBR was 113.9 b.p.m. Such HBR was conditioned by the fact that field maneuvers envisaged mastering of certain trainings tasks. Such training stage reflected in general structure of infantryman's motor actions and character of his physical loads. These actions are of collective character, but every officer has own kind of functioning, depending on his military specialty.

Actions in march were organized moving of military officers on IFV, mainly off roads and on field roads. IFV march took 6.3% of time. It should be noted that motor functioning of military officers at this time was minimal. But uncomfortable position inside IFV, durable static tension, vibrations, constant oscillations and certain gas contamination set significant requirements to organism. Mean HBR was 106.6 b.p.m. and in some cases increased up to 165 b.p.m. In such conditions high requirements are set to power and static endurance of arms' and back's muscles.

Functioning in the staging area took 3.1% of training time. Mean HBR increased to 109.2 b.p.m. but in part of the time pulse was from 180 to 200 b.p.m. (4.4%). In general such functioning was characterized more or less smooth pulse. Distribution of time for actions in different HBR ranges was the following: from 72 to 155 b.p.m. (94.5% of time). Loads in this period were qualified as aerobic-anaerobic from maximal to moderate aerobic power.

Defensive actions took 11.9% of training time. Military officers arranged company strong point. Work was fulfilled in quick temp and required physical and psychological loads. Mean HBR was 120 b.p.m. and maximal – up to 150 b.p.m. Most of time work was fulfilled with HBR of 100-140 b.p.m. (74.4% of time).

Actions in attack and capture of enemies object took about 1.1% of total training time. Mean HBR was at level of 138.1 b.p.m. and relative pulse intensity was 130%. It was the highest value in block of soldiers' functioning. As per the data of pulse registration main part of actions (up to 70%) was fulfilled with HBR of 140-165 b.p.m. and in 6.2% of time HBR was 160-180 b.p.m. Load at this stage can be qualified as aerobic-anaerobic near maximal and sub-maximal power.

Zombat shooting included preparation of ammunition and arms, directly shooting and etc. It took 12.5% of training time. Mean HBR was 83.2 b.p.m.; in some cases it raised to 140 b.p.m. and dropped to 60 b.p.m. Analysis of military officers' actions on preparation of arm and ammunition showed that they do not require great muscular efforts and are carried out more or less in calm condition. As far as with combat shooting defensive actions are trained, shooting was fulfilled from static position from trench and from IFV.

When moving by foot (1 march was 3.4% of general training time) mean HBR was 106.6 b.p.m. At the end of march (before halt for rest) pulse reached 160 b.p.m. During most of moving time HBR was 110-130 b.p.m.

The second march by foot (final one, which took place at the end of maneuvers) was mainly with HBR of 130-140 b.p.m. (23.3%) and in some cases maximal pulse reached 180 b.p.m.

Analysis of timing data showed that marches took 5.3% of training time and mean HBR was 142 b.p.m. (31.1% of march time). Military officers' work was, mainly, of cyclic character; it was interrupted by stops (for waiting for lagging persons). It conditioned wide range of HBR in movement.

Rest actions included eating, actions at bivouacs, preparing for sleep and night sleep. It took 27.4% of all time. Rests were distributed uniformly in process of maneuvers. Mean HBR was 60-70 b.p.m. At bivouacs it reached 80 b.p.m.

By the data of pulse register main part of actions during field maneuvers (up to 50%) was fulfilled with HBR of 100-140 b.p.m. and in 1.2% of time HBR was 160-190 b.p.m. Load in field maneuvers can be qualified as aerobic-anaerobic with near maximal and sub-maximal power.

The received data are given in table 1 and 2.

Table 1

Indicators of scope and intensity of loads during field maneuvers

Military applied actions	HBR (b.p.m.)	Time, taken by action (min.)	Relative tension of HBR (%)
Actions by training alarm signal	95.8	90	59.0
Preparation of arms and machinery for march and shooting	113.9	480	89.8
March on IFV with rest	106.6	182	77.7
Functioning in the staging area	109.2	90	82.0
Organization of defense and repelling of attack	120.1	344	100.2
Actions in attack and capture of enemies object	138.1	32	130.2
Combat shooting of company	83.1	360	38.5
First march by foot	106.6	98	77.7
Second march by foot	142.1	154	136.8
Eating, rest sleeping, hygienic measures	67.5	1050	11.5

Table 2

Indicators of loads during field maneuvers

Class interval s of HBR (b.p.m.)	Kinds of professional-combat functioning and time of actions																	
	Actions by training alarm signal		Preparation of arms and machinery for march and shooting		March on IFV with rest		Functioning in the staging area		Organization of defense and repelling of attack		Actions in attack and capture of enemies object		Combat shooting of company		First march by foot		Second march by foot	
	min	%	min	%	min	%	min	%	min.	%	min	%	min	min	min.	%	min	%
191-200		0.0		0.0		0.0	1	1.1		0.0		0.0		0.0		0.0		0.0
181-190		0.0		0.0		0.0	2	2.2		0.0		0.0		0.0		0.0		0.0
171-180		0.0		0.0		0.0	1	1.1		0.0	1	3.1		0.0		0.0	2	1.3
161-170		0.0	1	0.2	8	4.4		0.0		0.0	1	3.1		0.0		0.0	6	3.9
151-160		0.0	14	2.9	9	4.9		0.0	2	0.6	10	31.3		0.0	1	1.0	31	20.1
141-150	3	3.3	43	9.0	12	6.6	7	7.8	53	15.4	6	18.8	2	0.6	1	1.0	51	33.1
131-140	5	5.6	44	9.2	12	6.6	8	8.9	56	16.3	6	18.8	5	1.4	2	2.0	42	27.3
121-130	6	6.7	32	6.7	10	5.5	8	8.9	72	20.9	2	6.3	14	3.9	27	27.6	15	9.7
111-120	23	25.6	110	22.9	16	8.8	6	6.7	67	19.5	1	3.1	29	8.1	14	14.3	6	3.9
101-110	7	7.8	118	24.6	23	12.6	18	20.0	61	17.7	2	6.3	40	11.1	22	22.4	1	0.6
91-100	8	8.9	113	23.5	31	17.0	19	21.1	9	2.6	2	6.3	38	10.6	10	10.2		0.0
81-90	9	10.0	3	0.6	31	17.0	12	13.3	6	1.7	1	3.1	53	14.7	9	9.2		0.0
71-80	1	1.1	2	0.4	30	16.5	7	7.8	11	3.2		0.0	64	17.8	9	9.2		0.0
61-70	21	23.3		0.0		0.0	1	1.1	7	2.0		0.0	45	12.5	3	3.1		0.0
51-60	7	7.8		0.0		0.0		0.0		0.0		0.0	70	19.4		0.0		0.0
	90		480	-	182		90		344		32		360		98		154	

Analyzing timing data of field maneuvers we can note that the highest load was endured by military officers in attack actions and in marches. The least loads were endured with organization and fulfillment of combat shooting.

In general, physical load gradually increased from the beginning of training to the middle of the first day, when military officers mastered attacking actions. Then we observed its reduction and during certain period it was insignificant.

In the second day of training, loads' dynamic had other characteristic, videlicet: gradual increase of tension from moderate to maximal.

Discussion

As on to day, for optimization of military officers' physical fitness research and studying of loads' characteristics, which are endured by military officers during training combat actions (military training, field maneuvers, combat actions) are still urgent. In the process of our research we proved the character of military officers' actions, established by such scientists as L.A. Weiner-Dubrovin (1980), L.P. Popov (1983). We also supplemented indicators of scope and intensity of loads, endured military officers of mechanized units in their professional functioning, which were studied by L/P/ Leontyev (2000) and S.I. Glazunov (2003). Comparing with mentioned above scientists we researched wider spectrum of military applied actions. Measurements were carried out continuously from the beginning to the end of experiment. Modern technologies were used.

For the first time scope and intensity of loads of mechanized units' military officers in field maneuvers were determined. Class intervals of HBR during fulfillment of different professional actions were calculated. It permits to orient content and intensity of physical exercises, during training of exactly those exercises, which facilitate the most effective fulfillment of combat tasks.

Conclusions:

Analysis of HBR results showed that main part of motor actions was fulfilled mainly in aerobic-anaerobic mode. Three HBR ranges can be marked-out at these trainings:

1. Motor actions in HBR range from 60 to 100 b.p.m. – approximately 35% of training time.
2. Motor actions in HBR range from 100 to 130 b.p.m. - about 40.5% of training time.
3. Motor actions in HBR range from 130-160 b.p.m. – 23.25%.

Besides, little part of military officers' actions was conducted with HBR 160-190 b.p.m. (1.25%).

These data can be used for organization of physical training of mechanized units' military officers, for determination of its orientation, intensity and correlation of loads of different power.

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Conflict of interests

The authors declare that there is no conflict of interests.

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