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## ASSESSMENT OF PHYSICAL LOAD IN MILITARY TRAINING ON CADETS

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### INTRODUCTION

A defined physical effort may only result in defined adaptive changes. It is confirmed in practice, that this simple principle is not widely understood. Military training may well verify this hypothesis.

The most general objective of military training can be expressed very briefly as *effective performance of tasks on different levels of fatigue*.

These tasks most often demand using different weapons and armour, namely rifles, guns, aircraft etc. The more dynamic the task is and the longer it takes to solve it, the greater is the effect of fatigue upon the weapon user.

The dynamic and substance of soldiers' activity, particularly on battlefield, can be best compared with the behaviour of sportsmen, who have to act with great precision when homeostasis is disturbed.

The improvement of efficacy, both in sport and work of the militaries can be an effect of modification of training methods. However, one basic question arises: *can physical load be assessed in a simple way, to verify methods and means of training reliably and modify them properly?*

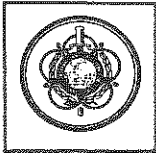
### THE METHOD OF PHYSICAL LOAD ASSESSMENT

In our study, we applied the method of Georgiev and Semov/4, modified by Jaskolski and Kalina (5,6). We think that this method meets the criteria defined in the above mentioned question. The method consists in:

- describing a given physical activity in a chronological system (further, we are going to use the terms "training" and "exercise");
- defining the duration of exercise, with the accuracy of 1 minute;
- defining the intensity of effort basing on the average heart (pulse) rate, measuring palpatively during 10 s, at different moments of physical activity (if the exercise lasts relatively long) or basing on the heart (pulse) rate, measured during 10 s, directly after finishing the exercise (if the duration is short - no longer than a few minutes);
- describing rest intervals in a chronological system (active or passive rest);
- defining the duration of training and the so called "pure work";
- calculating the physical load of specific exercises and specific rest intervals;
- calculating global training load;
- calculating the intensity of the so called "pure work" (effort excluding rest intervals).

The calculation is based on the following patterns:

$$OG = H + H_R + (OF.16) \quad (1)$$



$$I = \frac{OG}{B} \quad (2)$$

$$I_{OB} = \frac{H}{OB} \quad (3)$$

OG Global load

H Load of all exercises (the total amount of exercises duration products and the average heart rate)

H<sub>R</sub> The load of all intervals (the total amount of rest intervals duration product and the average of restitution heart rate.

B The duration of training

OB The duration of all exercises

OF Functional rest (measurement error, resulting from making the measurement of exercises duration and rest intervals duration even)

I The intensity of training

I<sub>OB</sub> The intensity of all exercises ("pure work")

The record of physical load should be made on special sheets of paper (table 1). The load structure can be graphically presented (fig 1).

Basing on physical load classification, made by Georgiev and Semov and numerous observations, we accepted the following characteristics of load:

1) global physics load (OR)

low up to 1500 agreed units  
average up to 1501 - 2100 agreed units  
high above 2100 agreed units

2) the duration of "pure work" (OB)

short up to 45 minutes  
average 46 - 75 minutes  
long above 75 minutes

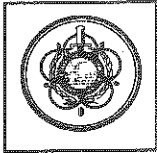
3) the intensity of training (I)

low up to 21,7 (HR - 130 beats per minute)  
average 21,8 - 24,2 (HR 131 - 145 beats per minute)  
high above 24,2 (HR = 145 beats per minute)

### The objective of studies and material

The objective of our study was to answer the following question: *is physical load during military training, conducted by different commanders comparable: if not, what are the differences?*

We observed different forms of military training in 3 cadet sections(platoons) of the Military Engineering School during five months of training. The cadets ranged in age from 20 to 23 years. Each platoon was trained by a different commander with 2 or 3 years' experience.



## Results and discussion

The results indicate that global load of training carried out by different commanders differed significantly. The main reasons for these differences were:

- different utilization of time, destined for the realization of a given topic;
- different total duration of exercises;
- different intensity of effort;
- different length of rest intervals, and therefore, different values of restitution heart rate and different load of rest intervals.

The differences that  $dX$  during the training can be well illustrated by comparing physical load during tactical training, carried out by different commanders (table 2). The commander of platoon X performed the exercises in 125 minutes, so their duration was 20% longer than the duration of exercises performed by commander of platoon Y. Still greater difference concerns the duration of "pure work" (31,3%). The intensity of exercises in platoon Y was 8,9% higher, and the intensity of "pure work" - was 15,5% higher. The duration of rest intervals was comparable. The global load was 12,1% greater in platoon X. The "pure work" load was 19,8% greater.

According to accepted criteria, global load of cadets from both platoons was high. The duration of "pure work" was long in platoon X and average in platoon Y. The intensity of training was low in platoon X and average in platoon Y.

None of the commanders utilized the training time optimally. One has to complete the observed task in 160 minutes. The commander of platoon X utilized the time in 78% and the commander of platoon Y in 62,5%.

Our study has proved that during each observed tactical training, the theoretical time was utilized in 57,5% and the effectiveness of the "pure work" amounted to 31,1%. The average intensity of trainings was 20,7 (HR=124,2 beats per minute), the intensity of the "pure work" - 24,18 (HR=145 beats per minute). the average global load was 1926,6 agreed units.

The effectiveness of utilizing the time for drill training was higher (B=77,2%, OB=58,1%). However, the individual load parameters prove, that drill, when carried out in a traditional way, does not constitute an essential physical stimulus. The average duration of the exercise was 60,5 minutes, including 45,6 minutes of "pure work". The intensity was 20,4 (HR=122,7 beats per minute). The intensity of "pure work" was 21,7 (HR=130,5 beats per minute). The average global load amounted to 1240 agreed units.

## Conclusions

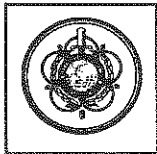
The study results prove the justification of utilization the applied method of physical load assessment in military training. This method provides us basic knowledge about the reasons, causing the defined adaptative changes.

The application of this method enables the recording of the most often applied exercises and utilization of these data when programming and planning the future training activity. Our experience in practical application of this method entitles us to claim that it is a simple means of modification of different forms of military training, connected with physical effort.

The study of cadets has revealed that during first five months of military training, the physical load is differentiated in different platoons. It proves different skills of physical effort dosage by commanders who carry out this training. Moreover, the study has revealed the areas, where it is possible to increase the effectiveness of training (better utilization of time destined for training, increasing the intensity of exercises and optimal utilization of rest intervals.)

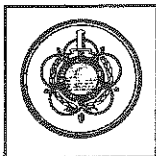
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# Load applied during physical training

B1 - training set out time

9.00

B2 - training completion time

10.03

Table 1

No	Training structure (the description of the exercises and the rest breaks)	Time		Intensity		Load	
		of exercise OB	of rest OR	HR for 10 s	$\bar{P}$ ( $\bar{P}_R$ )	H	H <sub>r</sub>
1	preparation exercises	15	-	20,22 26,24	23	345	-
A	passive rest	-	3	20,22 17	19	-	58
2	learning of defence grapples	20	-	23,25 27,25	25	500	-
B	passive rest	-	4	23,21 21,19	21	-	84
3	training fights - partner change every 3 min.	10	-	30,28,33 31,30	30,4	304	-
C	passive rest	-	3	27,25 23	23	-	69
4	relaxing exercises	5	-	23,21	22	104	-

B=63      OF=B-(OB+OR)

3	63	50	10
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OB=50

H=1253

OR=10

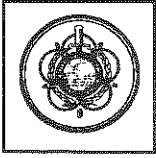
H<sub>r</sub>=211

OG=H+H<sub>r</sub>+(OF·16)

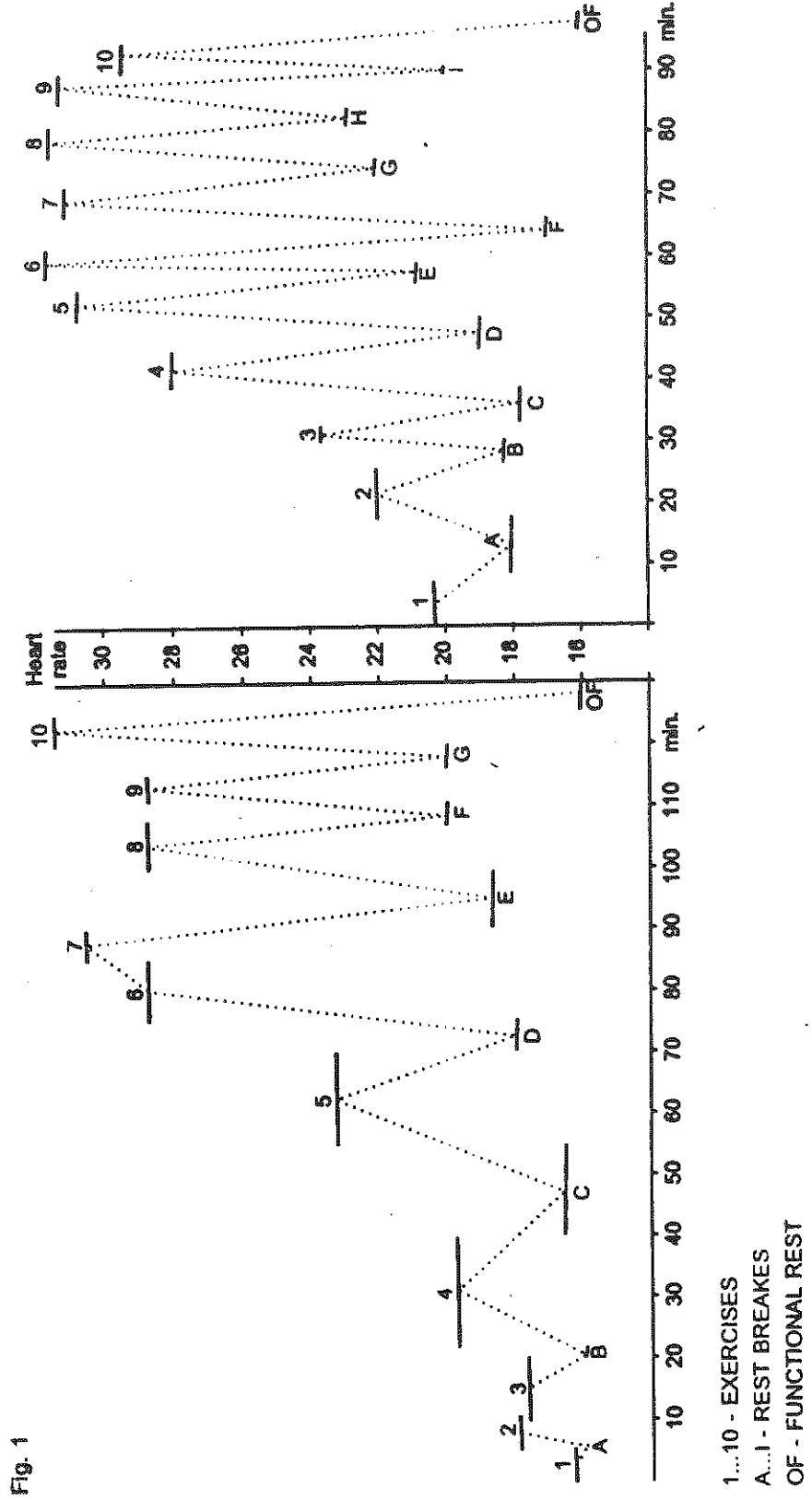
1512	1253	211	48
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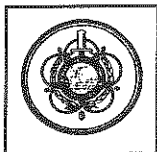
$J = \frac{OG}{B} = 24$

$J_{OR} = \frac{H}{OB} = 25$



# The characteristic of physical load applied during tactical training - "Soldier's activity on the confrontation area".





The comparison of the physical load applied during tactical training - "Soldier's activity on the confrontation area". The training was carried out by different commanders

Table 2

Load parameter	Platoon		the difference (%)
	"X"	"Y"	
Training duration (B)	125	100	20
"Pure work" time (OB)	84	58	31,3
Breakes duration (OR+OF)	41	42	2,4
"Pure work" load (H)	1997	1602	19,8
Breakes' load (H)	705	720	2,1
Total load (OG)	2714	2386	12,1
Intensity (I)	21,7	23,8	8,9
"Pure work" intensity (I)	23,6	27,8	15,5
The effectiveness of 160 min. utility of training time (%)	71,8	60,2	11,9