

MOTILITY STRUCTURE AND DYNAMIC SPECIFIC EFFORTS IN OBSTACLE COURSE TEST

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Abstract: *Basic motility skills are modeled after military test needs, adapted to overcome crossing obstacles, the test becomes very complex both in terms of physical request but also in terms of crossing obstacles art.*

The effectiveness of physical activity arises from the elements which characterizes it: length, distance and repeats (volume), load and speed (intensity) and the rate of performance (density).

By extension it can be compared with the toughest tests in athletics or other sports.

Keywords: *motility skills, specific effort, procedures, methods, ways, obstacle course.*

Given that the military test track with obstacles plays a particular importance in training for combat soldiers, training for obstacle course must be effective and streamlined.

If we improve marine student's functional and motility capacity with the help of specific athleticism instructional strategies, then the obstacle course performance behavior will be improved.

In the preliminary study we performed a study of the obstacle course motility structure, in order to shape conditional motility's technical behavior.

I have developed fact sheets for each obstacle noting the important moments, necessary qualities, succession of exercising, used methods and evaluation tests.

Measurements were made on the military sailors for both groups (experimental and control). One group worked by the operational projects and the converted strategies and one by the traditional ones.

Basic motility skills are modeled after the military test requirements, adapted to overcome crossing obstacles, the test becomes very complex both in terms of requests but also in terms of crossing obstacles technique.

By extension it can be compared with the toughest athleticism tests or with different sports.

Presenting the obstacle track

- The track has a length of 500m, with a number of 20 compulsory obstacles.
 - The width of the track is of 2m minimum.
 - The minimum distance between the obstacles is 5m minimum.
 - Track shape depends on the availability of land
- By extension can be compared with the toughest tests in athletics or other sports.
The 20 obstacles of the obstacle course test are:

ROPE LADDER	Tunnel with double bars
Double Bumper	Consecutive stairs
Network yarn	Floating ice
Network wires	The wall of attack
The ford	the pit
Espalier	vertical scale
Balance beam	assault wall II
Inclined wall	balance beam
Horizontal bars	the chicane
Irish table	consecutive walls

In order to optimize the preparation of sailor soldiers and not only, for the obstacle course (military pentathlon), it was necessary to do a preliminary study and to investigate both obstacle course motility structure, the effort dynamic during the test, as well as most crossing obstacles procedures used.

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The first motility structure of the test, movement difficulties study was necessary, that is strain types, likely to be modeled in the training process and dynamic effort in order to achieve fair correlation between the intensity of the competition and intensity of the chosen exercise.

In the table below there are shown the track obstacle, in order they appear in the contest.

The following aspects of structural motility dimensions are also recorded.

- duration of the work
- optimal work intensity
- cardio rate
- effort type
- the type of recovery for the three energy systems
- what we educate, develop, train
- preponderant ways and methods
- tests
- influence factors
- recommendations

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Motility structure	OB.1 - climbing, escalation, jumping OB.2 – excalation, jumping OB.3 - jumping, running OB.4 - crawling OB.-5 jumping OB.-6 escalation, jumping OB.-7 running (walk) in balance OB.-8 cățărare, tracțiune, săritură OB.-9 escaladare, târâre OB.-10 climbing, pulling, running, OB.11 - crawling, escalation, jumping OB.12 -escalation, jumping OB.13 - escalation, jumping OB.14 -escalation OB.15 - jumping, pulling OB.16 - climbing, escalation, jumping OB.17 - escalation, jumping pulling OB.18 - running zig-zag, balance OB.19 - running OB.20 - escalation, jumping
Duration of worl	Training duration is approximately 120 min. depending on the stage of preparation, at least 4 training a week are made, the rest of the training consists of the morning (running, mobility) and of basic military training conducted at least three times a week. Training for each obstacle last between 5 to 15 in the preparatory session (learning) and it's made in different trainings at the begining, afterwards this durations shrinks to only executing over a 5-10-15-20 obstacle depending on the training program.
Optimal work intensity	According to the type of the effort (aerobic, anaerobic) intensity might be from 70% (aerob) up to 90% - 95% (anaerobic lactacyd) and 95 % - 100% (anaerobic alactacyd) throughout the work. During periods of exercise intensity increases as we approach the competitive period when the volume decreases.
Cardio rate	From F.C. of about 76 hb / minut resting it can reach a rate of se up to 190 -200 hb / minut.
Effort type	Anaerobic alactacyd – anaerobic lactacyd – aerob.
The type of recovery for the three energy systems	Energy recovery must be made between: restoring fosfogen in the muscle (ATP ȘI PC) between minimum 2 min. and maximum 4 min.; restoring mioglobin between 1 - 2 min.; resynthesis the muscular glicogen - in two hours 40 % is restored duration of lactic acyd removal (oxygen).
What we educate, develop, train	Resistance under speed, speed treatment resistance, strength, expansion, skill Learning techniques of crossing over every obstacle and linking them to increased performance in terms of technical (development) of the sample as a whole (the 20 obstacles)
Preponderant ways and methods	Endurance training method; alternative-progressive method; fartlek method; training with ranges methods; Repeat training method; „stes” training method; control training method; amazonian method. (InU.S.A endurance runnings are made after an own training method, totaling everything that was better and more effective in preparing runners around the world) This method tried to combine training with ranges in an unitary and coherent way, fartlekul, marathon training. The method consists of the so cold „five consecutive steps”, that completes one. The five steps are: marathon training (is based on a long run of 40 – 50 km). During running 40-50 hb/min, serves the aerobic capacity); fartlekul (running in alternated tempo and running with acceleration); range training (change of duration and content, then increase the volume by increasing the number of repetitions training with reps (similar to range training, but with the difference that the rest is up to recovery); sprint training (seeks consistency between distance running and recovery time). Running on 50 m- 80 m – 100 m – 150 m -200 m -250 m – 300 m – 400 m – 500 m – 600 m depending on the time of training. Used means according to the applied training methods in the training lesson represented by the motility exercises. In the same time special exercises that form equipment exercises complexes are used, specialized equipment and devices. Depending on natural factors and hygienic conditions in which athletic activity, ways of body recovery after effort are applied. Depending on sports training factors, we can present the existence of the following types of motility exercises: contest exercises – the main training principles, contributing to the most direct way to complex physical adaptation of the organism for the characteristic effort of crossing each obstacle; special exercises – those motility actions whisch is part (sequences) of the test structure. These are distributed by the domain specialists (L. S. Homenkov, 1977; D. Alexandrescu, 1991; N. Alexe, 1993) in three main categories: exercises for learning and perfecting the art of competition, tactics exercises; special exercises, mainly oriented to developing motility qualities, specific to the test.
Tests	verifications are made after each stage to see accumulations quality. Besides testing the motility capacity(1000 m – length without momentum – push-ups), of physiological indicators (vital capacity – cardio rate) checking the assimilation technique both for each obstacle as well as for overall obstacle
Influence factors	Alactacyd anaerobic effort–ATP stocks and muscle PC; Lactacyd anaerobic effort– lactacyd concentration that allows the effort continuation; Aerobic effort –respiratory frequency; cardiovascular and respiratory system; energetic and endocrine system; capacitatea de oxigenare; oxygenation capacity
Recommendations	

Specific effort dynamic in the obstacle course

Physical activity causes anatomical, physiological, biochemical and psychological modifications.

Physical activity efficiency results from the elements that characterizes it: time, distance and reps (volume), load and speed (intensity) and performance frequency (density).

When the dynamic sports training is planned, these aspects called training variables should be considered.

In the obstacle course track, as well as military pentathlon, because of motility skills complexity, the diversity in training is essential.

All training components increase proportionally with overall improvement registered by the athletes.

The dynamic of such balance must be carefully monitored during all the annual planning fazes and throughout the career of the athlete.

As a first part of training, volume is a quantitative prerequisite (time, distance and reps) for high level technique, tactic and physical achievements.

• **Volume** refers to the total training effort of a preparing stage (training number, number of hours and days of training). A continuous volume of preparedness is one of the modern training priorities in order to successfully participating to competitions.

A high volume of training has a clear physiological justification: athletes can't physiological adapt without it.

Only a high number of reps can assure a quantitative accumulation necessary in execution, for improving the quality of the performance.

Performance is improved by growing the number of training lessons and the effort quantity filed in each training.

Recovery is accelerated once the athlete adapts to the increased amount of effort. 300 hours/year of training are needed (for obstacle course training).

There is a correlation between the amount of hours of training and desired performance.

However an increase in the amount of effort much can be harmful. Harre (1982) considers that this type of growth leads to exhaustion, low efficiency in training, uneconomical muscular effort and increased risk of injury.

Training volume is already sufficiently (taking into account all factors of training). It's much wiser to increase the number of microcycle trainings than the effort training volume.

In preparation we can calculate two types of volume:

- Relative volume - total dedicated time to prepare within a training lesson, known to the trainer;
- Absolute volume - measures the quantity of submitted effort by an athlete in time unit and is expressed in minutes.

Dynamic volume during stages of preparation varies depending on training objectives, the needs of competitive athletes as well as the competitive calendar.

❖ **Intensity**

Qualitative component of an athlete effort in a given period of time is also an important component of training. The more an athlete works hard in a unit time, the higher is the intensity. Is a function of nerve impulses that the athletes use in preparation. The force of a stimulus depends on straining, performance speed, intervals change or breaks between reps.

One important intensity element is physiological requirement of an exercise. Muscular exercise and SNC implication with maximum focus can determine the intensity in a preparation or competition frame.

Intensity can measure depending on exercising type. Exercises involving speed can be measured in m/s or rate/min of executing a move.

There are some measuring methods of stimulus force and, so, an intensity.

An alternative method is based on measuring the intensity of energetic system used in activities

Zone no.	Exercise duration	Level	Power generatic system	Ergogenesis %	
				Anaerobic	Aerobic
1.	1-5s	Up to the limit	ATP-PC	100-95	0-5%
2.	15-60s	Maximum	ATP-PC and LA	90-80	10-20%
3.	1-6 min	Submaximum	LA and aerobic	70-(40-30)	30-(60-70)
4.	6-30 min	Medium	Aerobic	(40-30)-10	(60-70)-90
5.	Over 60 min	Small	Aerobic	5	95

The obstacle course track fits into sub maximum zone no.3 in which speed and endurance plays dominant roles.

The complex nature of this test and drastic physiological changes (FC) up till 200 b/min as well as a maximum blood pressure of 100 ml/HG limits the duration up to 6 minutes. After the race the athlete has an oxygen debt of 70l/min an LA can be up to 250 mg

Organism reaches in an acidotic state in which it accumulates more LA than normal (PH7).

Adaptation to race is fast, especially to well trained athletes.

Compensatory mechanisms of circulatory and respiratory system are required to physiological limits, anaerobic glycolysis and aerobic system, are maximum required in the ergogenesis process, the result being a big debt of blood.

The organism hires LA and aerobic systems to produce the enquired energy.

During preparation, athletes are passing through various levels of intensity.

The organism adapts to physiological function growing to face the requirement of training. Based on these changes, especially an FC, the trainer can detect and monitor the intensity of a training program.

Zone	Intensity type	FC /min
1.	Small	120-150
2.	Medium	150-170
3.	Big	170-185
4.	Huge	Bigger than 185

Energetic used system

Intensity thresholds

For the obstacle course track and military track, the FC threshold beyond which the cardiovascular system will record the training effect is appreciated to 130b/min. This threshold varies due to individual differences in athletes. Karvonen, Kentala and Mustala suggested its determination by the sum of FC in repose plus 60% the difference between FC max. and the one in repose:

$$\text{FC threshold} = \text{FC repose} + 0.60 (\text{FC max} - \text{FC Repose})$$

In addition Teodorescu confirms (1978) that the athlete must use stimulus with up to 60% of its capacity to achieve maximum training effect.

There are two types of intensities:

- **Absolute intensity** that determines the maximum percentage necessary for performing and exercise;
- **Relative intensity** that determines the intensity for a lesson of microcycle, given the absolute intensity and the total effort in the same period.

The bigger the absolute intensity is the lower is the volume of effort. Absolute intensity lessons are bigger with 85% from maximum mustn't represent more than 40% of all lessons, using absolute intensity, smaller.

The relationship between volume and intensity

Determining the optimal mix between volume and intensity is a complex task. To calculate the volume, however often, we can use, the duration of a training lesson or the number of reps skills.

Although it's not accessible to many trainer, calculation of energy consumption may be a more exact appreciation of the importance.

FC is often used as an indicator of effort level but more for beginners.

It can help more in estimating the effort and reaction of the athlete effort.

The dynamic of volume and intensity growth

Given the athletes specificity in ANMB where in addition to training conducted mainly afternoons, they also participate in basic military training and even in morning revival almost daily, can be said to sum up the time at least 14-16 hours a week of preparation and training. Training courses will grow in steps. It may be that a lesson from a stage best not to meet the next stage because its intensity does not reach the threshold and not cause the required training. A lesson of training relates to the index of effort, otherwise is either too weak or too strong.

The athlete accumulates the capacity effort index in qualitative stages as a result of quantitative accumulation and adaptation of work to it. In preparation, adaptation of athletes, and exercise capacity index increase periodically in steps, not in a straight line. Best progression for growing preparation volume and intensity is next:

- Training volume;
- increased training duration (3x60'; 3x90'; 3x120');
- increasing the number of training lesson per week (3x120' 4x120'; 5x120);
- increasing the number of reps per training;
- increasing distance or duration (reps exercise);
- training intensity;
- increasing the pace (speed) skill execution;
- Increase the number of reps performed by athletes with the same intensity;
- reducing the resting interval between reps;
- Increasing the number of competitions.

Dynamic strength training used depends on the training, preparedness and performance of the athlete.

FC can help calculate the intensity of training. By using FC method for objective measure, the coach can calculate the total intensity of the training as an expression of total individual request felt during a lesson.

The intensity and dynamic intensity are, also a function of dominant biomotility function of the obstacle course track where the volume is the main element of progress in a given phase, intensity playing a smaller part. Volume and intensity are inversely proportional to the content of training, a higher absolute intensity should predominate in the executions of under 2 min (relationship between aerobic and anaerobic energy systems, is approximately equal). In the obstacle course track the aerobic power obviously dominates, emphasis will be on training volume.

Quantitative, the effort made by an athlete in a training lesson must be established by individual capacities, training phase and the correct ratio between volume and intensity. If managed training doses are properly managed, the result will be a proper sports development, which will lead to an adequate degree of preparedness. There are two forms of doses in the training, namely external and internal. External dosing or assignment, is a function of volume and intensity of training. It usually results, physical and psychological reactions of the athlete.

The individual reactions are internal dosage or load expresses the degree and extent of fatigue experienced by athlete. Each component of the external dosage affects the size and intensity of internal dosimetry.

- **Complexity**

Complexity refers to that sophisticated level of a training exercise. Skill complexity, coordination request can increase the training intensity.

A habit can cause learning problems and therefore an additional muscular request especially when neuromuscular coordination is lower. Volume, intensity and density, affect primarily the athlete in the training request. Although they complete each other great importance given to one or the other, can cause an increased demand the athlete. Planning and training directioning is a function of three main components. Volume and intensity evolution must be particularly directed, in direct relation with adaptation index of the athlete, training phase and competitive program.

GENERAL CONCLUSIONS

Both witness and experiment groups efectuated study, had the purpose on a way of verifying the training methods applied on the two groups and on the other way verifying actuating and functional components role in developing military obstacle course necessary abilities process, which plays an important role in training the military students for fighting.

Owing to the obtained results based on the statistical [arrangements](#) that are applied on the actuating and physiological characteristics adequate data, we can affirm:

- The specific actuating and physiological characteristics of the two groups, witness and experiment, are significantly different from the initial testing to the final one, the training progress is having an ascending trend.
- Both groups subjects obtained results have an ascending trend, ascertaining a performance improvement from one testing to another.
- Planning a one year training with clear training stages, realising some training programs according to domanin's novelty emphasized on this first year's training on the correct technique attribute of passing the obstacle in different conditiond , unilt the ones in the competition (only having the best fitness training), led to results improving and to tend international level results.
- Ph-functional characteristic value growth, passing the obstacles continuously prefecioning, will make that the next period's training results(with the selected one's) will grow in value.

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