ANAEROBIC EXERCISE AND INCREASE IN SPECIFIC PERFORMANCE IN THE UTILITY SWIMMING TRIAL

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Abstract: *In the research, we used different methods that highlighted, on the one hand, the evolution of performances in the naval pentathlon and, on the other hand, the relationship between some components of performance capacity and competitive results. In this sense, in addition to the known methods for investigating somatic, physiological, and motor parameters, we used new and adapted methods that targeted specific physical training and the specific psychological profile of the naval pentathlon athlete.*

Key Words: Naval Pentathlon, anaerobic effort, sport performance, utility swimming.

INTRODUCTION

The research began with the desire to obtain important results at the Naval Pentathlon competitions organized by the CISM with the representative team of the Mircea cel Bătrân Naval Academy from Constanța. We can achieve these results only through a superb preparation of the athletes through modern means and training adapted to the event in which they are participating. The training effort is the process of conscious overcoming, by the athlete, the demands of training for physical improvement, to reach a higher technical and tactical level, as well as to emphasize the psychic and intellectual factors, the results of which intentionally produce changes in the capacity of performance and adaptation of the organs and functional systems involved.

PURPOSE OF THIS RESEARCH

This study identified the factors that condition the improvement of the anaerobic effort capacity of athletes participating in the utility swimming test within the Naval Pentathlon.

RESEARCH OBJECTIVES

To conduct this research, we established the following objectives: a. Identifying the most effective evaluation tests aimed at highlighting the level at which the anaerobic capacity of the athletes is located and subsequently, leading to an increase in the anaerobic capacity of the athletes in the Utility swimming test. b. Identification of the biological and motor parameters that condition the achievement of sports performance through the level of anaerobic

capacity/resistance specific to the utility swimming test in the naval pentathlon. The pedagogical observations were part of the training lessons conducted with the military athletes and members of the naval pentathlon team. With its help, I followed and was able to correct the motor behaviour of the athletes, the different states depending on certain situations (training, competition, recovery), and self-control under conditions specific to the utility swimming test.

Tests to assess functional capacity:

1. Respiratory rate (r/m)
2. Underwater swimming (dry)
3. Vital capacity (cm3)
4. Heart rate (bpm)
5. Anaerobic power testing by performing a series of 1-minute treadmill runs at a 10% incline.

Fig.1 Treadmill

In this study, we followed a number of important steps:

a. *Data collection regarding the somato-functional and motor parameters of the subjects.* They were made using a professional TANITA MC 780 device and a dedicated analysis software, version 3.4.5, with the support of FEFS Constanța from the "Ovidius" University.

Fig2. Tanita MC 780

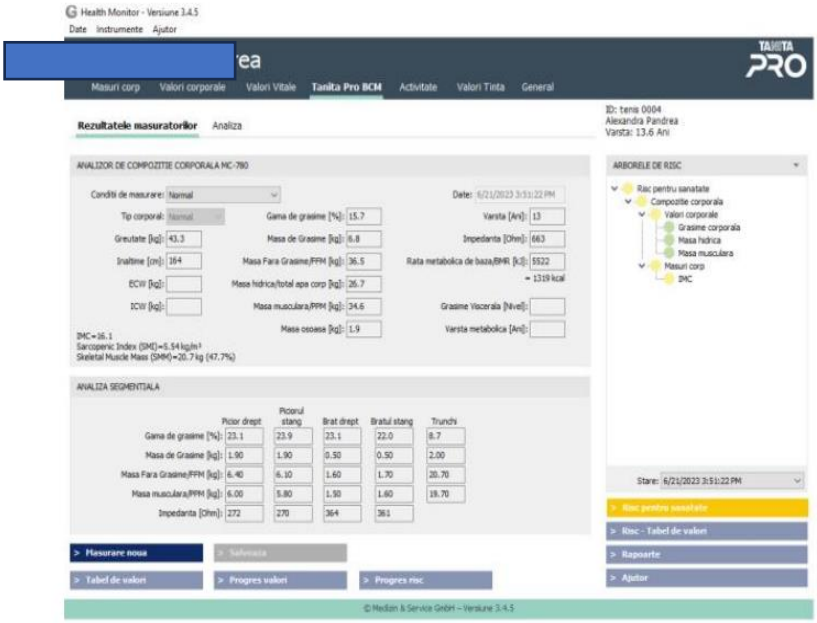

Fig.3 Soft Tanita MC 780

Studying body composition in selected athletes is important for several reasons:

1. Health assessment: Body composition can provide important information about children's health, such as body fat percentage (kg and %), muscle mass (kg and %), bone mass, skeletal muscle mass, and basal metabolic rate. This information can be useful for identifying potential health problems and developing an appropriate care plan.

2. Identifying nutritional problems: body composition assessment can help identify nutritional problems and provide opportunities for improving nutrition and overall health.

3. Monitoring progress: periodic (4 months) assessment of body composition may be useful to monitor the progress and effectiveness of care interventions. This can be important to adjust the plan of care and ensure continued improvements in health and nutrition; TANITA multi-frequency monitors are capable of measuring bioelectrical impedance at three or six different frequencies. The additional frequencies provide an exceptional level of accuracy compared with single- and dual-frequency monitors. The lower frequencies measure the external impedance of the cell membrane. The higher frequencies are able to penetrate the cell membrane, measuring the impedance both at the lower level and at high frequencies, thus allowing estimation of extracellular and intracellular water as well as total body water. This information is essential for

providing data about a person's health status and indicating possible health risks. TANITA PRO SOFTWARE–version 3.4.5 - The Tanita PRO software package was developed in partnership with the most important medical software developer (Medizin & Sevice GmbH), which is able to store and analyze data from the Tanita MC 780 monitor. In accordance with EU regulations, both the body composition analysis device and the software are medically approved and comply with the regulations in force. (Medical Devices Directive, Council Directive 93/42/EEC of 14 June 1993 on medical devices).

b. The age of the subjects:
The subjects of the preliminary research were aged between 19 and 21 years.

c. Gender of the subjects;
All subjects in the preliminary research were male.

d. Biometric data using the TANITA MC 780 device:
Using the TANITA MC780 and TANITA PRO SOFTWARE the following measurements were generated:

• Body mass (kg)

• BMI (kg/h2);

• Body fat (%)

• Muscle (%)

• RMB (kcal); Basal Metabolic Rate (BMR) - The BMR is an estimate, automatically generated by the TANITA PRO software, of the minimum number of calories a person needs every day to maintain the body's functions (respiration, circulation and digestion) during rest. For the correct measurement of the subject's height, it is necessary for him to be without shoes, in a sitting position (orthostatism), touching a vertical wall with his back, head, and heels; the head is oriented looking forward. With the help of the telemeter, the distance from the ground level to the perpendicular projection on the wall of the level of the vertex point (the highest cranial point) is measured and determined with an object that has an angle of 90o (e.g. a square with a right angle), placed with one of the sides on the vertex and one on the wall. It is recorded in centimetres and subdivisions of 0.5 cm.

Ethics: This study was conducted in accordance with the Declaration of Helsinki.

In conclusion, body composition assessment in students selected for the naval pentathlon site may be important for identifying health and physical activity issues, monitoring progress, and developing personalized interventions.

e. *Testing the motor parameters of the preliminary research subjects.*

1. Respiratory rate (r/m)
2. Underwater swimming (sec)
3. Vital capacity (cm3)
4. Heart rate (bpm)
5. Anaerobic power testing by performing a series of 1-min treadmill runs at a 10% incline (the total distance covered by each individual will be noted)

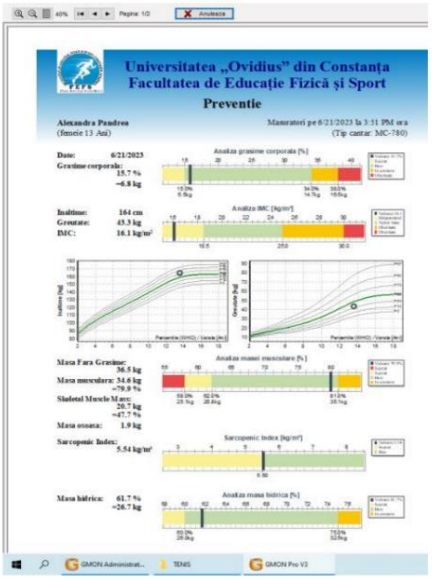

Fig. 4 Model analysis

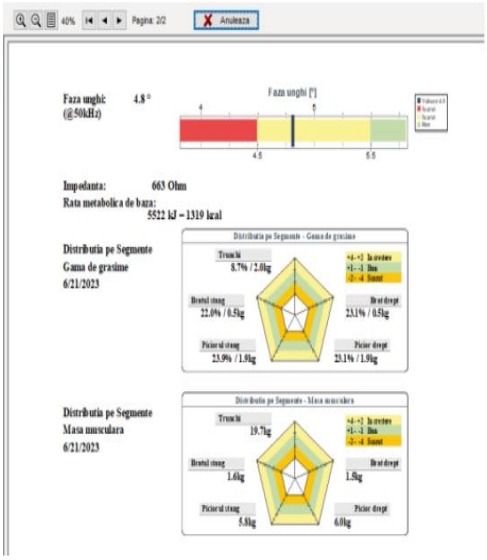

Fig.5 Model analysis

The training model of the naval pentathlon athlete at the Utility swimming test - applied swimming during a macrocycle

Mesocycles	Accommodation	Basic 1	Basic 2	pre-participation	Competitive	Total
Weekly	3	5	13	4	3	**28**
No. training sessions / week	2	2	3	2	2	**11**
Total antr./mesocycle/hours	6/13	10/18	39/83	8/13	6/9	**63/136**
M1. Start and free swim 25m.	1 hours	1½ hours	5 hours	1 hour	1 hours	**9½ hours**
M2. Transporting a weapon (3 kg) over a distance of 25m	1½ hours	2½ hours	10 hours	1½ hours	1 hours	**16½ hours**
M3. Passing under an obstacle located 3m deep and 60m from the start	1½ hours	1 hours	4 hours	1½ hours	½ hours	**8½ hours**
M4. Passing over an obstacle fixed on the surface of the water 90m from the start.	2½ hours	4½ hours	9 hours	1½ hours	1 hours	**18½ hours**
M5. Recovery of an object located 3m deep and 100m from the start.	5½ hours	6½ hours	50 hours	6½ hours	4½ hours	**73 hours**
M6. Final sprint 25m, starting from the distance of 100m from the start	1 hours	2 hours	5 hours	1 hours	1 hours	**10 hours**
TOTAL	**13 hours**	**18 hours**	**83 hours**	**13 hours**	**9 hours**	**136 hours**

To analyse the involvement of anaerobic effort (anaerobic V-R speed effort) for 1 min. - 1 min. 35sec in the utility swimming test-applied swimming, we started from the 6 moments of the test that occurs in 25 m pools:

1. Start and freestyle swimming 25 m.
2. Carrying a weapon (3 kg) over a distance of 25 m (for men only).
3. Passing under an obstacle located at a depth of 3 m and 60m from the start (35m for women).
4. Passing over an obstacle fixed on the surface of the water 90 m (65m for women) from the start. The obstacle is represented by a cylinder covered with neoprene that rotates freely. The height of the cylinder above the water is 0.25 m.
5. Recovery of an object located 3 m deep and 100/75m from the start.
6. The final 25 m sprint, starting from a distance of 100/75m from the start. The event ends when the swimmer touches the wall of the pool. The swimming style is freestyle.

Regarding physiological aspects, studies have shown that both aerobic and anaerobic metabolism are important for swimming performance.

Swimming performance depends on physiological (endurance capacity and anaerobic fitness) and technical and morphological factors. The increase in the workload was achieved for all the tests specific to the naval pentathlon. The focus of the training was directed toward aerobic and mixed efforts toward the end of the 13th week; the volume

reached its maximum value in the first part of the megacycle (the first 4 weeks); In the second part of the mesocycle, the focus of preparation was channelled toward mixed and anaerobic efforts. Given the large amount of time allocated during training to improve specific metabolisms, knowledge of energy balance in different performances is important for training-specific prescription. In this sense, the interval training method was used in the training lessons, both for general and special physical training. Anaerobic interval exercises using 4-10 sets of 15-30 sec total work interspersed with 45sec-12 min recovery breaks have been shown to significantly increase VO2max.

Anaerobic resistance is determined by: - type of muscle fibers;

-energy reserves – ATP, CP, muscle glycogen;

-resistance to acidosis, respectively to lactic acid accumulated intracellularly and in the blood . Although the aerobic contribution appears to be easily calculated by the integral of oxygen consumption (VO2) during exercise, the determination of the anaerobic contribution is complex.

CONCLUSION

Underwater swimming, implicitly anaerobic effort, is particularly important in the naval pentathlon, both in the utility swimming event and in the equipped swimming event, and we recorded an increase in the value, as a result of the specially applied program.

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