

# STUDY OF VITAL CAPACITY INDICATORS IN UNDERWATER ATHLETES DEPENDING ON THEIR SPECIALIZATION AND TIME PERIOD

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## ABSTRACT:

**Goal.** To study the indicators of vital capacity of the lungs (VEL) of submariners specializing in swimming in the stayer, sprint and underwater disciplines in 2000, 2010, 2020. **Materials and methods.** The study involved submariners aged 20 to 25 years (10 women and 10 men), in each time period. Each athlete is a member of the national team of the Krasnoyarsk Territory and has a sports category not lower than the candidate for master of sports. The following methods are used in the work: the method of evaluating morphofunctional indicators. **Results.** Analyzing the indicators of the VEL in the time period, we can note the fact that in 2020 the indicators are higher compared to previous years, which indicates high functional capabilities of the respiratory apparatus. As athletes divers specializing in underwater distances, have the highest rate of VC in comparison with athletes with long-distance runners and sprinters. **Conclusion.** The data obtained in the course of the study can serve as an effective pedagogical tool in the training of submariners. The study allows us to summarize that women and men who are engaged in underwater sports in 2020 have higher rates of VEL than athletes of 2000 and 2010. Intensive training regimes of highly qualified athletes, in cyclical sports, place increased demands on the external breathing apparatus, and scuba diving is just the kind of sport where the cardiorespiratory system plays a significant role.

**Keywords:** underwater swimmers, training process, morphofunctional characteristics, sports specialization, vital lung capacity.

## 1. Introduction

Scuba diving is one of the most difficult water sports. The main task of athletes - submariners is swimming, diving and diving with the use of special equipment and equipment [4]. To date, the high level of achievements of athletes on the Russian and world stage places

increased demands on the level of training due to the use of new techniques and innovative technologies [1]. One of the innovative approaches in the training process is to take into account the adaptive capabilities to physical exertion and the individual characteristics of the body-the morphotype [3]. Sports specialists and scientists have proven that taking into account morphofunctional characteristics contributes to achieving high results [2,5,7,8]. The authors of scientific papers that conducted research in various sports indicate the need to take into account the morphofunctional features of the body when planning physical activity and choosing a sports specialization [6]. In scuba diving, according to V. S. Anishchenko, one of the important functions that determine performance is the function of breathing. The study of the maximum respiratory capabilities of an athlete helps to identify indicators of his performance. In this regard, swimmers-submariners, in comparison with representatives of other sports, have high rates of spirometry.

**Goal.**To study the indicators of vital capacity of the lungs (VEL) of submariners specializing in swimming in the stayer, sprint and underwater disciplines in 2000, 2010, 2020.

## 2. Materials and methods

The study involved submariners aged 20 to 25 years (10 women and 10 men), in each time period. Each group of athletes has its own designation. Athletes of 2000 – group A, athletes of 2010-group B, athletes of 2020-group B. Each athlete of the group is a member of the national team of the Krasnoyarsk Territory and has a sports category not lower than the candidate for master of sports. The following methods are used in the work: the method of evaluating morphofunctional indicators. The vital capacity of the lungs was measured using a special device-a spirometer. The subject made the maximum exhalation after a deep breath. He exhaled into the spirometer, pressing the mouthpiece tightly against his lips.

## 3. Results

Sports training helps to increase the functional capabilities of the body, and they largely ensure the achievement of high sports results. With a competent construction of the training process, taking into account individual anthropometric indicators, the reserve capabilities of the body increase, increasing its biological stability and reliability of the system. The study of the functional state of the external respiratory system is an important indicator in the preparation of an athlete.

Given that indicators of lung capacity of swimmers-submariners has not been investigated fully, we decided to conduct a comparative analysis summarizing the data on the members of the national team of Krasnoyarsk region, depending on the time period and specialization.

The resting VEL values of male submariners specializing in sprint distances are shown in Figure 1, those of stayers in Figure 2, and those specializing in scuba diving in Figure 3.

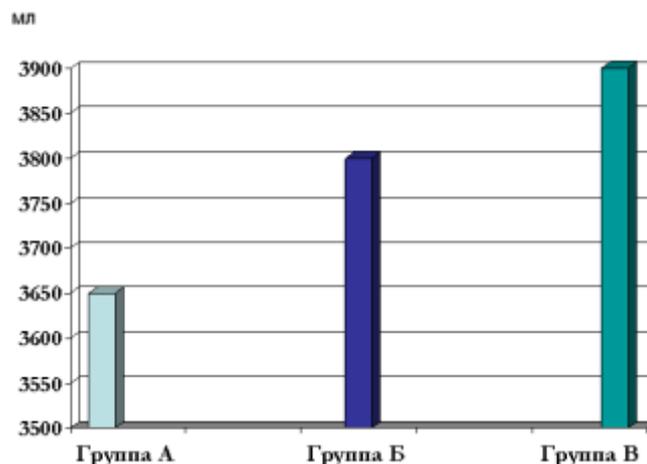


Figure 1. Indicators of vital capacity of the lungs in swimmers-submariners sprinters (men).

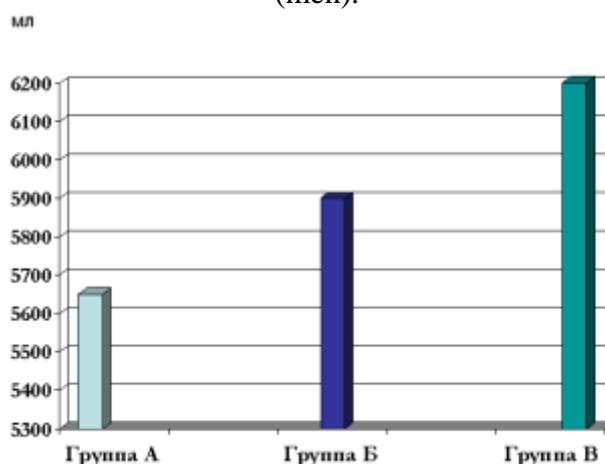


Figure 2. Indicators of vital capacity of the lungs in stayer swimmers (men).

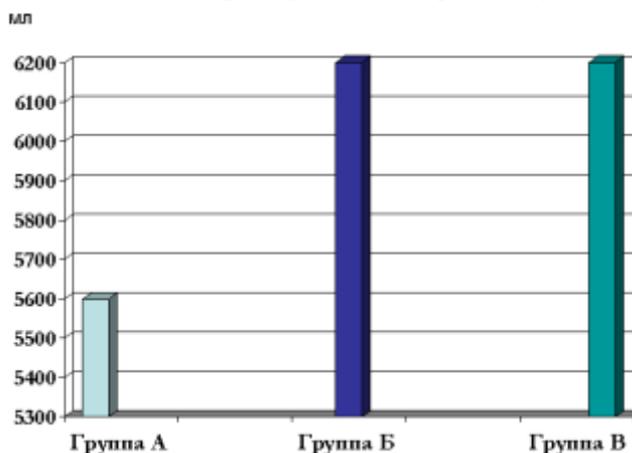


Figure 3. Indicators of vital capacity of the lungs in submariners (men)

The average VEL values among sprinters in group B range from 5000 to 6800 ml<sup>3</sup>, in group B-from 4900 to 6000 ml<sup>3</sup>, in group A - from 4900 to 5400 ml<sup>3</sup>.

Among the stayers in group B, the VEL values range from 5200 to 7200 ml<sup>3</sup>., in group B-from 5000 to 6700 ml<sup>3</sup>., in group A - from 5300 to 6000 ml<sup>3</sup>.

Among submariners in group B, the VEL values range from 6000 to 7830 ml<sup>3</sup>., in group B from-5400 to 6700 ml<sup>3</sup>., in group A from 5200 to 6000 ml<sup>3</sup>.

Analyzing the indicators of the VEL in the time period, we can note the fact that in 2020 the indicators are higher compared to previous years, which indicates high functional capabilities of the respiratory apparatus. According to O. Yu. Stepanova, intensive training regimes of highly qualified athletes, in cyclic sports, place increased demands on the external breathing apparatus, and scuba diving is just the kind of sport where the cardiorespiratory system plays a significant role. Indicators of vital capacity of the lungs in swimmers-submariners sprinters (women) are shown in Figure 4, stayers-in Figure 5, swimmers-submariners in Figure 6.

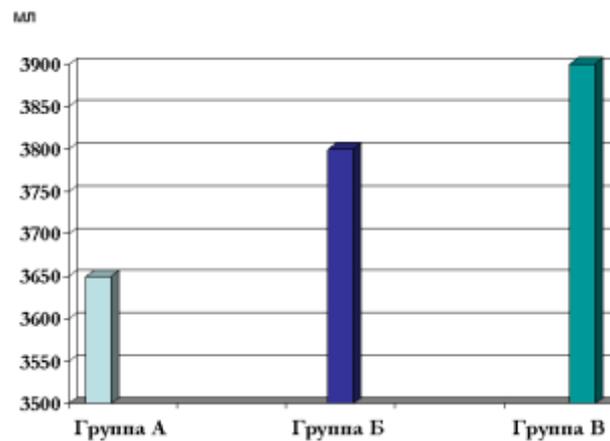


Figure 4. Indicators of vital capacity of the lungs in swimmers-submariners sprinters (women)

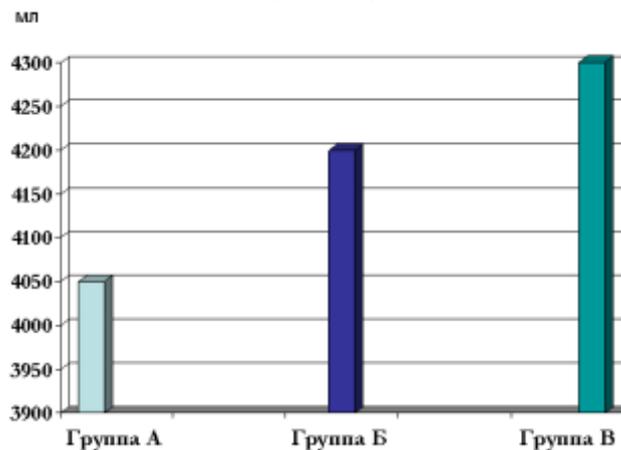


Figure 5. Indicators of vital capacity of the lungs in stayer submariners (women).

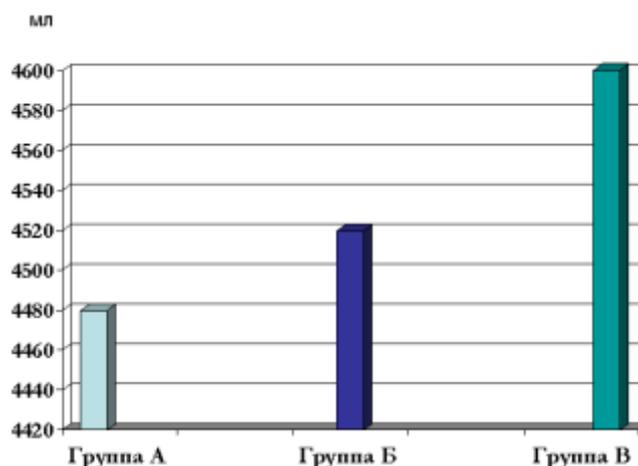


Figure 6. Indicators of vital capacity of the lungs in submariners (women).

The average VEL values among sprinters in group B range from 3700 to 4100 ml<sup>3</sup>, in group B from 3600 to 4000 ml<sup>3</sup>, in group A from 3300 to 4000 ml<sup>3</sup>. Among stayers in group B, the VEL values range from 4000 to 4600 ml<sup>3</sup>, in group B from 3700 to 4500 ml<sup>3</sup>, in group A from 3600 to 4500 ml<sup>3</sup>.

Among submariners in group B, the VEL values range from 4200 to 5000 ml<sup>3</sup>, in group B from 4000 to 5000 ml<sup>3</sup>, in group A from 4300 to 4660 ml<sup>3</sup>.

Women continue to have the same trend as men, with the highest rates of VEL in 2020.

#### 4. Conclusion

High level of sports achievements, competition in the fight for the right to be the first require constant improvement of the quality, efficiency and individualization of the training process. The growth of achievements in underwater sports is largely determined by the constant improvement of the methods of training qualified athletes.

Using the data on morphofunctional characteristics, the coach can correctly determine the sports specialization for the athlete, which in the future, at the stage of sports improvement and the stage of higher sports skill, will allow to individualize training methods, on the basis of which to achieve the highest sports results.

The conducted research allows us to summarize that women engaged in underwater sports in 2020 have higher indicators of VEL, which in turn characterizes higher morphofunctional capabilities of the body than athletes of 2000 and 2010. In men, the same trend continues.

Also, athletes who specialize in underwater exercises have a larger lung volume than athletes who are stayers and sprinters. This can be explained by the specifics of scuba diving, where there are special requirements for the work of a submariner in anaerobic conditions (the ability to hold your breath when diving at a length of 50 m and work with scuba diving in hypoxic conditions).

#### 5. Reference

1. Analysis of the regularity of the increase in world records in underwater sports (swimming in fins). Moskovchenko O. N., Tolstopyatov I. A., Redi E. V., Ivanitsky V. V., Zakharova L. V. // Theory and practice of physical culture. - 2019. - No. 969.- p. 70-73.

2. Zhukova E. S. Improvement of competitive activity in high-speed swimming in fins for athletes aged 13-14 years / E. S. Zhukova, V. E. Aslayeva // Questions of functional training in sports of the highest achievements. - 2017. - No. 1.- p. 35-40.
3. Kononova E. V. Adaptation of children and youth in modern socio-economic conditions based on health-technology/ Kononov E. V. Morphofunctional types of physical development of persons with different motional regime, Abakan, 2015 – 148-150C.
4. Moskovchenko, O. N. Underwater sport and diving: textbook: Dictionary/sost. O. N. Moskovchenko, I. A. Tolstopyatov, A. V. Alexandrov. - 2nd Ed., reprint. and DOP. /Krasnoyarsk. GOS.PED. V. P. Astafyev Univ. - Krasnoyarsk, 2014. - 316 p.: il. KSPUim. V. P. Astafiev, SibGAU named after M. F. Reshetnev, M.: Flinta, M.: Nauka.5. Bendikova, E. Lifestyle, Physical and Sports Education and Health Benefits of Physical Activity / E. Benedikova // European Researcher. – 2014/ No. 69 (2-2). – P. 343-348.
6. Gaurav, V. Anthropometric characteristics of Indian volleyball players in relation to their performance level / V. Gaurav, A. Singh // Turkish Journal of Sport and Exercise. – 2014. – Vol. 16(I). – P. 87-89.
7. Morphofunctional markers of kinetic aptitude in a sport selection system. / Moskovchenko O., Ivanitsky V., Zakharova L., Tolstopyatov I., Kattsina T., Redi E., Shumakov A., Lylina N., Shibin D. // Journal of Physical Education and Sports. – 2018. – P. 670-676.
8. Special Aspects of Psychophysiological Reactions of Different Skillfulness Athletes, Practicing Martial Arts. /Pordigalo L., Iermakov S., PotopV. et al. // Journal of Physical Education and Sport, 2 (Supplement issue). – 2017. – P. 519-526.