

# Identification of diving athletes' sports specialization through their physical and functional attributes

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## Abstract

**Objective of the study** was to determine the physical and functional attributes of athletes who excel in sailing, sprinting, and underwater sports.

**Methods and structure of the study.** The research was conducted by a group of scuba divers, ranging in age from 18 to 25 years, consisting of 15 male and 15 female participants. Each participant is a member of the Krasnoyarsk Territory national team and holds a sports title of at least Master of Sports of Russia. The research employed a variety of methods, including the assessment of anthropometric and morphofunctional parameters, as well as the application of mathematical statistical techniques.

**Results and conclusions.** Athletes who specialize in diving disciplines belong to the second type of morphofunctional physical development (MFTFR), according to the classification of O.N. Moskovchenko. These athletes have an athletic build and are typically of above-average height and light weight, which helps them to more easily overcome the surface of the aquatic environment. Scuba divers who specialize in sprinting and other underwater disciplines also belong to this group. Swimmers, on the other hand, have a longer body and higher weight, which allows them to perform speed and power work at a high level. Data obtained from the study can be used as an effective tool in training scuba divers, as it provides insight into the interrelation between sports specialization and morphofunctional characteristics. This information can serve as a scientific foundation for organizing the training process.. The dynamics of changes in morpho-functional parameters depending on specialization provide an opportunity to justify the choice of an underwater sport, which allows predicting a high performance of an athlete and personalizing the training process.

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

**Introduction.** Underwater swimming is a sport based on swimming, diving and diving under water using special equipment, devices, apparatus and equipment [10]. The high level of achievements of athletes in the Russian and world arenas places increased demands on the level of training due to an increase in the volume and intensity of physical activity [11]. However, the volume and intensity of the load cannot be increased indefinitely, since the athlete will reach an adaptation limit and the growth of results will stop [1]. This indicates the need to use innovative approaches in the training process. Morphotype is one of the indicators of individual characteristics

of the body and its adaptation to physical activity [4, 5, 7]. Sports experts and scientists have proven that taking into account morphofunctional characteristics contributes to the achievement of high results [2, 3, 6, 7]. Authors of scientific papers who conducted research in various sports point to the need to take into account the morphofunctional characteristics of the body when planning physical activity and choosing a sports specialization [8, 9, 12]. However, only a small number of works are devoted to the study of the morphofunctional characteristics of the body in underwater sports, which determined the relevance of this study.



**The purpose of the study** is to identify the morphofunctional characteristics of scuba diving athletes specializing in sailing, sprinting and underwater disciplines.

**Methods and structure of the study.** The following methods were used in the research: analysis of data from literary sources and methodological materials; method of assessing anthropometric indicators (height, weight, chest circumference measurement); method of assessing morphofunctional indicators (heart rate, systolic blood pressure (SBP), vital capacity (VC), minute blood volume (MBV)). The method of mathematical processing was used to ensure the reliability and validity of the research results. The following were carried out: 1) correlation analysis of the relationship between the sports result, body weight, height and VC among sprinters, 2) correlation analysis of the relationship between the sports result, height, body weight and VC among long-distance runners, 3) correlation analysis of the relationship between the sports result, body weight, height and VC among athletes swimming underwater exercises. Mathematical processing of the results was carried out on a personal computer using the programs Microsoft Word and Microsoft Excel. The study involved underwater swimmers aged 18 to 25 years (15 boys and 15 girls). All athletes are members of the Krasnoyarsk Territory

national team and have a sports title of at least Master of Sports of Russia.

**Results of the study and discussion.** Competent construction of the training process taking into account individual anthropometric indicators increases the reserve capacity of the body, increasing its biological stability and reliability of the system. Considering that the morphofunctional characteristics of underwater athletes have not been studied, we decided to conduct a comparative analysis, generalizing the data obtained during the study on members of the Krasnoyarsk Territory national team depending on gender and specialization (Table 1).

Based on the results of the study, the following conclusion can be made: athletes specializing in long-distance running can be attributed to the second morphofunctional type of physical development (MFTPD), which is characterized by harmony, average values of anthropometric indicators in relation to age-sex standards without significant changes in morphofunctional indicators, satisfactory adaptation of the cardiovascular system (CVS) and morphofunctional indicators.

Athletes-divers specializing in sprint distances and underwater exercises can be attributed to the third MFTPD, which is characterized by well-developed bone and muscle tissue, high and above average val-

*Table 1. Physical development indicators of underwater athletes depending on gender and specialization*

Indicators	Women	Men
<b>Sprinters</b>		
Height (body length) (cm)	167-178	168-194
Weight (body mass) (kg)	61-71	66-92
Chest circumference (cm)	77-80	95-102
Vital capacity (ml)	3800 - 4200	5000-6900
SBP (mmHg)	110 - 115	110-120
Resting heart rate (bpm)	60 - 64	60-63
<b>Stayers</b>		
Height (body length) (cm)	166-177	165-184
Weight (body mass) (kg)	56-67	62-85
Chest circumference (cm)	75-78	90-95
Vital capacity (ml)	3700 - 4600	5000-7000
SBP (mmHg)	115 - 120	105-120
Resting heart rate (bpm)	59 - 64	55-60
<b>Submariners</b>		
Height (body length) (cm)	163-171	171-189
Weight (body mass) (kg)	53-76	79-95
Chest circumference (cm)	83-87	106-113
Vital capacity (ml)	4300 - 5200	6000-7900
SBP (mmHg)	105 - 120	110-120
Resting heart rate (bpm)	60 - 64	61-63



Table 2. Comparative analysis of the relationship between sports results and physical parameters of highly qualified underwater athletes

Anthropometric parameters	Correlation coefficient	Correlation coefficient
Sprinters	Women	Men
Height	0,32	0,43
Weight	0,73	0,75
Vital capacity	0,51	0,63
Stayers	Women	Men
Height	0,21	0,30
Weight	0,54	0,51
Vital capacity	0,69	0,71
Submariners	Women	Men
Height	0,30	0,29
Weight	0,76	0,81
Vital capacity	0,75	0,78

Note: ( $r < 0,30$ ) – low degree of dependence; ( $r$  from 0,31 to 0,50) – weak; ( $r$  from 0,51 to 0,70) – average; ( $r$  from 0,71 to 0,80) – good; ( $r$  from 0,81 to 0,90 and higher) – strong.

ues of anthropometric parameters in relation to age-sex standards, high adaptive capabilities of the CVS.

Athletes specializing in long-distance swimming have an athletic build, average - above average height and low weight. This helps to overcome the surface of the water environment more easily. Submariners and sprinters have the largest body length and weight indicators, which is important when performing speed-strength work. The morphotype largely determines the functional capabilities of the athlete, which will ultimately be reflected in the predisposition to the choice of specialization in a particular sport. The correlation dependence between the morphofunctional parameters of underwater athletes and their sports specialization is presented in Table 2.

From the analysis of Table 2 it follows that weight has a good degree of dependence on the sports result among sprinters in men and women ( $r=0,75$  and  $r=0,73$ ), the vital capacity indicator has an average value for both men and women ( $r=0,63$ ,  $r=0,51$ ). There is a weak correlation between height and men and women ( $r=0,43$ ,  $r=0,32$ ). Among long-distance runners, the vital capacity indicator has a good correlation among men ( $r=0,71$ ), and an average correlation between this indicator and women is observed ( $r=0,69$ ). The height indicator has a low degree of dependence for both men and women ( $r=0,30$ ,  $r=0,21$ ). Weight in this specialization of underwater sports, for men and women, has an average degree of dependence ( $r=0,51$ ,  $r=0,54$ ). A strong correlation with weight is observed in scuba diving athletes in both men ( $r=0,81$ ) and women ( $r=0,76$ ). A good correlation is also observed in men and women with VC ( $r=0,78$ ,  $r=0,75$ ). A low correlation

is observed in men and women with height indicators ( $r=0,29$ ,  $r=0,30$ ).

**Conclusions.** A high level of sports achievements, competition for the right to be the first require constant improvement of quality, efficiency and individualization of the training process. The growth of achievements in underwater sports is largely determined by the constant improvement of methods for training qualified athletes. Using data on morphofunctional characteristics, a coach can correctly determine the specialization for an athlete, which in the future, at the stage of sports improvement and the stage of higher sports skills, will allow individualizing training methods, on the basis of which the highest sports results can be achieved. Taking into account individual anthropometric indicators and competent construction of the training process, the reserve capabilities of the body increase, increasing its biological stability and reliability of the system.

The established morphofunctional markers can be successfully used in determining specialization, as well as in sports selection and technical training of athletes.

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