The relationship between the level of development of qualitative and quantitative indicators of physical fitness of students specializing in swimming

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Abstract

Objective of the study. This study is aimed at establishing the degree of motor skills development among students specializing in swimming, both in the aquatic environment and on land.

Methods and structure of the study. The study was organized and conducted using a pedagogical experiment at the Department of Physical Education of the State University of Management located in Moscow. The analysis of the data obtained during the testing of students, including compliance with standards in water and on land, allowed us to identify key factors affecting the functional state of the body and improving the athletic performance of swimmers.

Results and conclusions. The results of the study demonstrate that the manifestation of the motor abilities of student swimmers during the performance of test tasks in water and on land can be assessed as the relationship of various indicators of strength, speed and other physical parameters. Observations showed that coordination skills, a sense of rhythm and distance were manifested in the process of performing swimming and running exercises, along with strength indicators. These observations were carried out by pedagogical methods during swimming and running classes.

Keywords: *motor skills, swimming, aquatic environment, functional state, motor abilities, physical parameters, coordination skills, sense of rhythm, swimming exercises.*

Introduction. In most cases, it is advisable to start the educational and training process in a swimming pool with the goal of overcoming the competitive distance more quickly from an early age. At the same time, a characteristic feature of every swimmer is the possession of a "sense of water" that makes it possible to stay on the surface of the water and move along it with the help of water–bearing movements at all stages of training [1].

This sensation occurs due to analyzers of the palm surface of the hand and other parts of the body, which contributes to the formation of swimming skills in childhood, as well as further training and improvement in adulthood.

At the same time, the skills necessary for swimming are formed not only directly in the aquatic environment, but also on land. Being in the water, a person remains at the mercy of motor automatisms, inherent since childhood for movement in terrestrial conditions. The pool is affected by the phenomena of "skill transfer" and antigravity reflexes. However, the reflex function still remains somewhat similar despite moving in a horizontal position as opposed to a vertical position.

In the case of switching from the pool to the stadium for classes, as in the water, reflexes such as rhythmic, alternating movements (walking), automatic hand/foot coordination are manifested on land [3]. J. Councilman noted a single principle of creating a base of endurance before switching to speed work, typical for training swimmers and athletes.

In particular, it has been found that highly developed muscle feeling and the plasticity of cortical pro-

cesses characteristic of swimmers, runners, and athletes in other sports are of the greatest importance [1, 2]. All movements take place in space, in time, with a certain speed and acceleration.

The use of exercises such as arm rotations with an increase in the speed of movements on the side of the pool during a warm-up, arm extension in a tilt with a rubber shock absorber - a positive transfer of the speed and accuracy of muscle effort is carried out during overcoming the competitive distance in the aquatic environment.

Nevertheless, the presence of makings in the above-mentioned cyclic forms is due to a good orientation in space, coordination of movements with hands and feet, and the presence of a "sense of time". The presence of predisposition in this aspect is structured by spatiotemporal and dynamic (force) perceptions and sensations [3, 5]. Presumably, the systematization of power characteristics will reflect the reproduction of muscle effort when performing cyclic exercises.

Objective of the study is to determine the level of manifestation of the motor abilities of student swimmers in water and on land.

Methods and structure of the study. In this study, motor abilities are defined as a set of qualitative and quantitative characteristics of speed, strength, and endurance. At the same time, the strength with which the necessary speed is gained and maintained to overcome the distance in running and swimming is an indicator of the submaximal or maximum power of the applied effort.

The strength indicators were calculated as the product of the athlete's mass and speed, taking into account the weight and speed coefficients. The units of measurement of force were set in Newtons (N), power in watts (W). The results of physical activity in dynamics were recorded and processed based on the calculation of energy supply for muscle work, kgf *m (kilogram-force-meter). The speed indicator is the speed of swimming a distance for a certain time in the water and running test exercises on land (m/s).

The endurance index was determined by the method of timing, taking into account the speed of overcoming the distance (km/ h). The subsequent interpretation of the criteria for the intensity of muscle activity allows us to identify the relationship of the data obtained.

The indicators of motor and swimming fitness were interpreted in numerical terms along with the calculation of the strength parameters required in order to gain the necessary speed and then maintain the pace on the treadmill and swimming track.

The ratio of speed to strength and endurance is characterized by the power indicator (W). The first two indicators were characterized by the body's ability to withstand hypoxia, which is an indirect measure of anaerobic capacity during endurance work [3].

Spirometry was used to determine the VEL, using a SP-1 spirometer.

The results of the pedagogical experiment were processed using an online platform, dnevnik-samokontrolya.ru, where the possibility of automatic calculation of the received data was provided [4]. Methods of mathematical statistics were used to assess the significance of the Fisher criterion (F). Using the F-test, the variance was calculated within the group. The pedagogical experiment was conducted on the basis of the Department of Physical Culture of the Moscow State University of Management. The examination of students on a number of tests, followed by passing the standards in water and on land, allowed us to identify the most influential of them on the functional system of the body and the increase in the result of athletes-swimmers.

Results and conclusions. Analyzing the classes with students at the stadium, when running 1 km, the power figures were 222.70 watts, with an average result of running the distance in four minutes. The regression equation y=14.424+0.064x1-0.0000452x3 means that with an increase in power by 1 Watt, endurance increases by 0.064 km/h, and

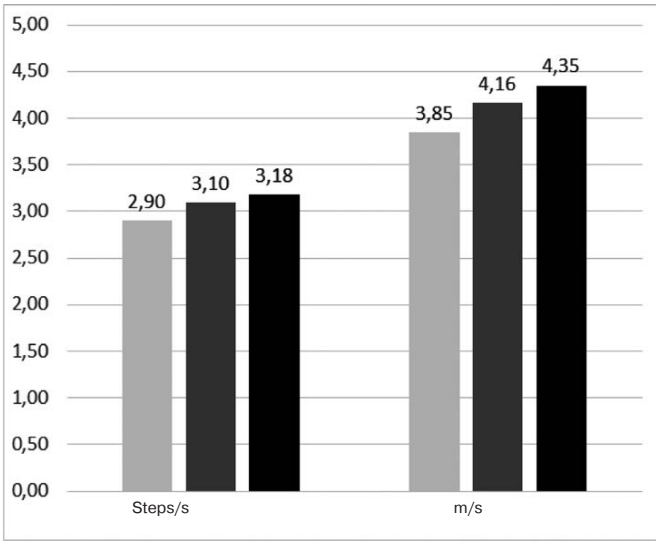

Fig. 1 The dynamics of the increase from minimum to maximum and the average pace of races per 1 km

with an increase in 1 kcal, endurance decreases by 1.084 km/h. At the same time, the equation takes the form: y=228.517 +0.327x1-75.446x3, the significance is confirmed by the fact that with an increase of 1 step, the result increases by 0.32 s, with an increase in tempo by 1 step per second, it improves the result by 75.45 s.

To overcome a distance of 400 m in a single style, the average power was 252.32 watts, which corresponds to a well-developed functional system and the level of development of general and special endurance. The equation y=2.781+0.00081x1 indicates that endurance increases by 0.81 km/h with an increase of 1 liter. The athletes with the best results had significantly the best performance indicators. Obviously, this had an impact on the pace and rhythm of swimming the distance.

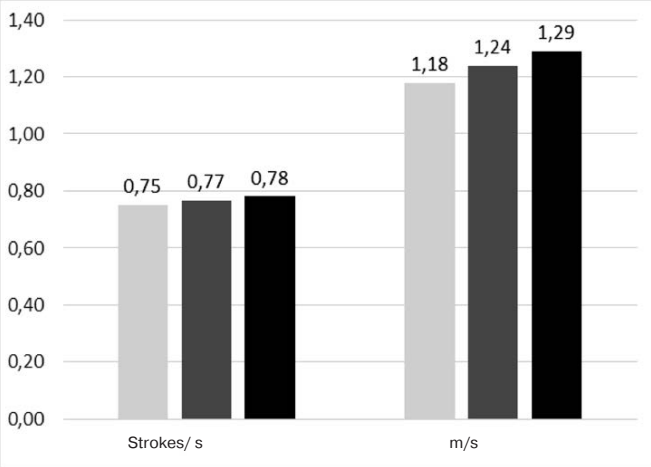

Fig. 2 The dynamics of the increase from minimum to maximum and the average speed of swimming the 400 m distance in a style

In the aquatic environment, the "sense of support" for effective forward movement is largely due to properties such as buoyancy, streamlining, and differentiation of muscular efforts. The ability to enhance rowing during training helps to swim the distance faster, which is confirmed by the power indicators, which averaged 730.73 Watts when overcoming a 50-meter distance. The correlation relationship according to the Fisher criterion of 0.029441271 turned out to be significant, F<0.05. The equation 15.181-3.681 x 1+0.421 x 2 means that if you decrease by 1 stroke per second by lengthening it, the distance of 50 m swims 3.68 seconds faster. With an increase of 1 stroke, the result increases by 0.42 s.

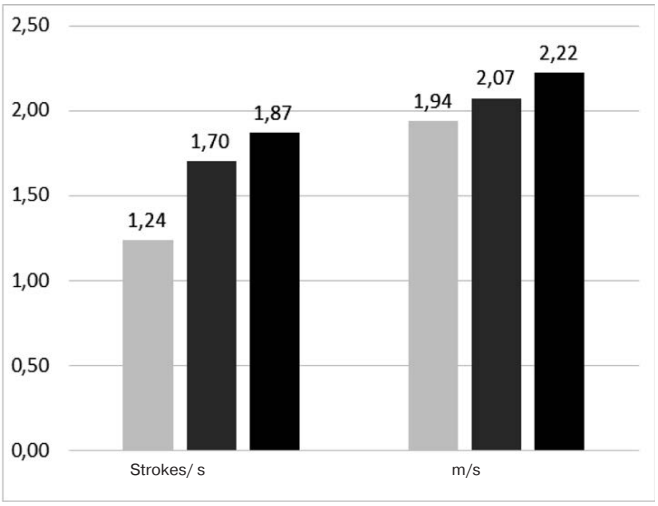

Fig. 3 The dynamics of the increase from minimum to maximum and the average speed of swimming the distance of 50 m in style

Performing rotations of straight arms with acceleration from a standing position and in a tilt on land, traction in an inclined position of the trunk clearly had a positive effect on further improving the quality of speed and differentiation of muscular efforts in the water. The use of interval and variable training methods has had a great impact on the development of speed and strength endurance. At the same time, the ratio of speed, strength qualities, and endurance should be considered as separate parameters that make up the motor ability as a whole.

Conclusions. In the process of performing swimming and running exercises, combined with strength characteristics, coordination abilities, a "sense of rhythm", and a "sense of distance" were shown through pedagogical observations in swimming and running. These sensations were provided by the functioning of the proprioceptive analyzer system, interconnected with the sensory system of the swimmer's body, muscle receptors in running.

The comparison of the interaction of "muscle feeling" and coordination on land was considered as a direct complement to each other, followed by exercises in the water. At the same time, the sensory perception of the aquatic environment was complemented by the differentiation of muscular efforts due to power, which is based on speed and strength characteristics.

At the same time, the ability to quickly gain maximum speed while maintaining the required pace at a distance is visually complemented by the level of strength development in most of the upper body in

the pool, and the muscles of the lower body in the stadium. On average, a satisfactory display of motor abilities in running depends on functional indicators, which, without special training, usually do not give a high score, $p>0.05$.

In the aquatic environment, buoyancy and streamlining are interrelated with the position of the body, while freestyle swimming is associated with the power of alternating strokes with the hands, which means with what force the swimmer gains a set speed. Therefore, in order to gain the necessary speed at an average distance, a force of 9.843 kgf/cm^2 was applied.

The power for the fastest movement in the aquatic environment was 888.89 Watts with a force of 16.30 kgf/cm^2. The speed indicators in the speed and power characteristics averaged 2.07 m/s, integrating with a special endurance of 7.47 km / h, in interaction with which it is necessary to maintain a set speed to the finish line. The regression equation is significant and reliable at a 95% probability level, $p<0.05$.

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