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IMPROVING THE EFFICIENCY OF STARTING FROM STARTING STAND FOR HIGHLY QUALIFIED SWIMMERS

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Abstract

The goal of the work is to verify the effectiveness of a set of exercises aimed at increasing the efficiency of starting from the starting stand for highly qualified swimmers specializing in short and medium distances. The experiment involved 20 highly qualified swimmers with a sports rank of master of sports at the age of 18-25 years. The experiment lasted 21 days in the process of training camps aimed at preparing for the main start of the season. The studied indicators: explosive force, the starting reaction time, the swimming time of the starting segment with a length of 15 m, distance speed. In the hall, exercises of speed-power orientation were used to train the time of a simple reaction, explosive force. In water exercises were used to improve the technique of starting from the starting stand. Part of the exercises was carried out under normal conditions, the other part was performed using a special simulator (pneumatic starting stand). The peculiarity of the use of the pneumatic starting stand is that it allows to increase the effectiveness of the start training in swimming by reducing the time of the motor reaction and increasing the repulsive force. As a result of using the complex of exercises, swimmers significantly improved indicators of explosive strength, simple reaction time and starting speed in general. This set of tools can be used in the training of highly qualified swimmers for short and medium distances.

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Keywords: Explosive force, launch technique, pneumatic starting stand, physical exercises, swimming, speed of a simple motor reaction.

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1. Introduction

In swimming at short and medium distances, the start plays a big role. The result of a swimmer largely depends on the starting technique. Moreover, in addition to the launch technique, the degree of development of speed-power abilities (in particular, explosive power) and speed abilities of swimmers have a great importance. Veiga and Roig (2016) note the impact of start and turn indicators on the performance of highly qualified swimmers. It also emphasizes the importance of starting and turning workouts in preparing swimmers. In the works of various specialists, data on ways and methods of developing explosive power in various sports are widely presented.

For the development of explosive strength (speed strength) of athletes, there are various techniques. So, in the work of Comyns et al. (2015), the effect of the buttock warm-up protocol on the efficiency of jumps was shown, and also the rest interval is important. The purpose of this study was to investigate the effects of a low-load gluteal warm-up protocol on countermovement and squat jump performance.

However, not all types of massage lead to better results. A study by Arabaci (2008) shows that performing a 10-minute Swedish massage of the hind and 5-minute front lower limb adversely affects the vertical jump, speed and reaction time, and also positively affects sitting test results and achievements

Trainers use Plyometric Jump Training to train explosive strength. For example, studies conducted by Sammoud et al. (2019) showed that short-term seasonal plyometric jump training included in regular swimming lessons cause better performance than regular swimming training in improving jumping and sport-specific swimming results among male prepubertal swimmers. However, during the training of young soccer players Rodriguez-Rosell et al. (2017) founded that although the results show that a combined strength training and plyometry program can be effective in gaining increased strength, jump and sprint for players of different age used by the training program is usually less effective as the age of the players increases. This shows the presence of various sensitive periods of the development of speed-power abilities.

The effects of resistance training are also shown to improve explosive strength in various sports such as tennis (Terraza-Rebollo et al., 2017), weightlifting (James et al., 2018) and soccer (Griffiths et al., 2019). But at the same time, there are many questions to resistance exercises. Buckner et al. (2018) believe that the great amount of evidences suggest that weight training can indirectly affect athletic performance by preventing injury, rather than directly improving athletic ability.

In various sports, trainers use physical exercises to develop explosive strength. For example, soccer coaches indicate that they often use the following exercises: Wind sprints from different positions, Wind sprints in combination with exercises to improve the reaction time with the ball, Sprints for short wind distances, Fast running along the center line of the field, Winding with the ball and less often Wind sprints in combination with exercises to improve reaction time, Maximum speed running from different positions, exercises using simulators, barbells and weights (Bolotin & Bakayev, 2017)

In recent years, video training (Powless et al., 2020), biofeedback (Harvey et al., 2011) and the neurocognitive training program (Moya-Vergara et al., 2019) have been increasingly used to train reaction time (Reaction time training). At the same time, the question of the effectiveness of sensorimotor training of athletes remains. In addition, the researchers show the dependence of reaction time on various

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parameters, for example, the athlete's weight (Rodriguez-Arce et al., 2019), the athlete's condition (Afon'shin & Rozhencov, 2015; Bushueva et al., 2019), and the level of sportsmanship (Cohen, 2012), as well as other parameters.

Thus, the relevance of the selection of physical exercises for the development of explosive strength and speed of reaction in swimming are increasing.

2. Problem Statement

In scientific and methodological literature, much attention is paid to the analysis of starting and turning techniques. The practical experience of the trainers indicates qualitative and quantitative changes in the starting technique. However, experts and practitioners still have no consensus on the effectiveness of modern launch options, on the specifics of the jumping technique, depending on the preparedness of the athletes and the way of swimming. Therefore, athletes do not use the full potential of starting technology. In this paper, we consider means of increasing the effectiveness of the launch technique.

3. Research Questions

- Does the use of a special set of exercises in the gym and in the water aimed at developing explosive strength and speed of reaction affect the swimmer's starting fitness?
- Does the use of exercises on the special simulator "pneumatic starting stand" influence the swimmer's starting fitness?

4. Purpose of the Study

The aim of this work is to develop and test a set of exercises aimed to increase the efficiency of start from the pedestal for short and medium distances.

It is assumed that the inclusion in the educational process of training high-skilled swimmers of a set of exercises aimed to increase explosive strength and special technical training devices will enhance the start efficiency and improve sports results in general.

5. Research Methods

The main research methods are: testing the level of development of explosive strength (Abalakov test) and speed abilities of swimmers (starting reaction time, distance swimming time), as well as a pedagogical experiment to evaluate the effectiveness of a specially developed set of exercises.

5.1. Participants

The study involved 20 qualified swimmers specializing in swimming at short and medium distances, aged 18 to 25 years, having a sports rank of master of sports. Swimmers trained on the basis of the "Swimming Center" in St. Petersburg.

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5.2. Procedure

The pedagogical experiment was carried out at the end of the preparatory period of the training process. Athletes were preparing for performances at the main competitions of the season (Russian Championship). The duration of the precompetitive mesocycle was three weeks.

Athletes trained 10 times a week, on average 2 times a day. (Wednesday and Saturday - 1 training, evening basketball game; Sunday - a day off). The duration of the training was 1.5-2 hours.

Training sessions were held in the gym and in the water. The main attention was paid to the development of speed-power capabilities of swimmers. In the hall, exercises on the development of flexibility were also used. As the main starts approached, more attention was paid to the development of flexibility.

In the hall, a set of exercises was used to develop a simple motor reaction (Table 01).

Table 01. A set of exercises to develop a simple motor reaction

Content	Doze	Methodical reception
Signal start from the main launch post	3	Stretch in the arrow, pull the foot
Start on a signal from the stop position crouching	3	Highest jumps
Start on a signal from the lying position	3	Take the starting position as quickly as possible
Start signal from a sitting position	3	Take the starting position with maximum speed
Start on a signal from a standing position on one knee	3	Jumping legs together, hold arrow
Starting from a signal from a standing position on both knees, the arms rest on the floor	3	Take the stop position crouching then start
Flexion and extension of the arms in an emphasis lying down (push-ups). On signal - start.	3	Take the starting position as quickly as possible

Also, a set of exercises was used in the hall for the development of explosive strength (Table 02).

Table 02. Complex of exercises for the development of speed strength

Content	Doze	Methodical reception
Long jumps from a place	12	(push off with two legs).
“Running on one leg” (horse racing) jumping on one leg	8	Jump high
jump rope at a high pace a) on two legs; b) on one leg.	15 sec	on the toes
Jumps on one leg in the upper limb in the arrow with an accentuated pulling of the knee of the jogging leg to the chest	16	Run on the spot
Jumping rope with knees pulled to the chest	15	Keep maximum pace and amplitude
Three jumps up and forth, the fourth from the squat up in the arrow	12	Stretch into the arrow as if starting a jump.
Jumping in a step with a strong push up with "freezing"	12	Extremely strong repulsion

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The number of episodes ranged from 2 to 4 in one lesson.

The rest interval between exercises is 1.5-2 minutes , between series - until complete recovery (6-8 minutes).

In the rest intervals, stretching and relaxation exercises were performed.

Jumping to a different-height pedestal was usually carried out according to the following procedure: 4 series of 10 jumps each, continuously. In each subsequent series, the height of the cabinet increased.

1st series - jumping onto a pedestal 50 cm high;

2nd series - jumping onto a pedestal 70 cm high;

3rd series - jumping onto a stand 90 cm high;

Series 4 - jumping onto a stand 110 cm high.

The pace of jumps is average, the number of jumps either remained unchanged (10 repetitions in one series), or decreased with each series (the first series of 20 jumps ; the second - 15; the 3rd - 10; the 4th - 5). The rest interval between series is 3-5 minutes. The rest intervals used relaxation exercises.

As the main starts approached in the training process on the water, there was a decrease in the total volume of swimming and the duration of the training work (respectively, from 55 to 25 km, from 25 to 13 km). The intensity of classes was spasmodic with peaks occurring in the first and third weeks of the mesocycle. The number of trainings for three weeks did not change (both on land and in water).

In the preparatory or final part of the training session in the water, the swimmers performed special exercises to improve the starting technique. To do this, swimmers performed a series of starting jumps on a signal under normal conditions and using the “pneumatic starting stand” simulator (Kochergin, 1992). When using the pneumatic starting stand, the swimmer, at the moment of his natural repulsion, was given an artificially organized additional force from the outside, directed forward-upward. Each series consisted of three jumps. In one training session, 2-4 series of jumps were included, while a series of jumps under normal conditions alternated with jumps in a simulator.

At the beginning and end of the experiment, swimmers measured such indicators as: the level of development of explosive strength (Abalakov test); starting reaction time (Omega ARES 21), the swimming time of the segment is 15 m.

To assess the statistical significance of differences in the values of the indicators before and after the experiment, the nonparametric Wilcoxon test was used.

6. Findings

After the pedagogical experiment, an increase in the degree of development of speed-power abilities was discovered among the participants of the experiment.

Table 3 illustrates the changes in the value of indicators of speed-power abilities of swimmers after the experiment.

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Table 03. Results of testing indicators before and after the experiment

Index	Before the experiment	After the experiment	P-level
Starting reaction (s)	0.695	0.6435	0.07
Distance swimming time 15 m from the start (s)	5.9315	5,673	0.007 *
Average speed (m / s)	2,525	2,641	0.047 *
Abalakov Test (high jump, cm)	53.85	61.2	0.005 *

In general, swimmers significantly ($p < 0.05$) reduced the time of the starting reaction, and the time of swimming the distance of 15 m from the start was reduced. Significantly ($p <0.05$) improved indicators of explosive strength (Abalakov test). It is due to these parameters that athletes began to demonstrate a higher speed of overcoming the distance.

The change in the start reaction time is not statistically significant. This is probably due to the fact that this parameter is very difficult to train and only within certain limits. This is due to the innate characteristics of the individual to a greater extent than training. In addition, the duration of the experiment, apparently, is not long enough for significant changes in the time of the starting reaction.

If we compare the results that athletes showed after the completion of the pedagogical experiment in short sprinter sections (25 m and 50 m), which were swam from the start at maximum speed in different ways, we can note that these indicators also improved. Moreover, personal trainers of athletes justify this improvement in results by more efficient execution of the starting jump. When analyzing the individual phases of the starting jump, the coaches noted a special change in the direction of improvement in the more powerful repulsion of swimmers from the starting table, which favorably affected the flight phase and longer sliding, which was accompanied by an increase in the speed of athletes as a whole.

7. Conclusion

The specially developed set of exercises is based on the use of the “pneumatic starting stand” simulator in the training process of swimmers. The use of this simulator in combination with the execution of team starts in normal conditions, as well as a wide arsenal of jumping exercises in the gym, allowed athletes of the experimental group significantly improve the performance of starting preparedness.

Based on the results obtained, it can be judged that the proposed methodology for improving the starting technique is effective and can be recommended for use in the training process by qualified swimmers.

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