

## Peculiarities of training and competitive activity of sportsmen-sprinters in track and field athletics

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### Abstract:

The purpose of this study was to determine the complex motor quality in the structure of motor actions of training and competitive activity at men sprinters in athletics. *Objects:* 12 sportsmen of high qualification of the group of the highest sports skill took part in the research. 6 sportsmen took part in the experimental work and the control group was created out of 6 sportsmen. *Methods:* test trainings are aimed at variable influence of motor quality from speed development. Control and experimental groups used in training exercises that ensured speed development at intensity of 80-90% of maximum. The developed and used complex of special running exercises in the experiment was based on scientific publications, personal experience, surveys of coaches who have experience of working with national teams of the corresponding level of sports training. The experimental group used a complex of multifunctional exercises in trainings which are aimed at variable influence of motor quality, which ensured development of speed. A repeated method of performing exercises was used to develop speed capabilities. *Results:* using the complex of multifunctional exercises aimed at variable influence of motor quality contributed to strengthening the general potential to perform exercises at maximum rate. Efficiency of using the repeated method of performance of exercises at maximum rate on trainings was experimentally defied. The use of special running exercises on the subsoil of dynamic forces and the method of complicated conditions during speed exercises contributed to the mastery of skills in sprint, correct foot setting, position of torso and work of hands during running. It is also confirmed by the experiment that the effectiveness of exercise increases significantly if the exercise is adversarial. Using the method of complicated conditions in the performance of speed exercises contributed to the setting of the technique of performance to the correct running movements during the performance of speed work. The gradual preparation of sportsmen' musculoskeletal system for the maximum running rate contributed to the improvement of test sports indicators in speed and agility of both the experimental group and the control group. *Conclusions:* using the correct choice of special running exercises and method of carrying out trainings which are aimed at improvement of motor quality provided improvement of sports results. The proposed complex of preparatory special running exercises allows carrying out training classes taking into account individual opportunities and sports qualification of sportsmen.

**Keywords:** special running exercises, motor quality, speed, agility, qualified athlete

### Introduction

One of the most important physical qualities of a sportsman is speed - ability of a person to perform motor action in a minimum period of time for these conditions. The nature of physical qualities is investigated by scientists in numerous directions, so S. Aurobindo believes that nature pushes, forces a person to master or achieve domination over his environment to create and win [13]. Svechkariov V.G. considers the nature of physical quality as the disclosure of a wide variety of human deposits and abilities. Optimally specified physical activity develops and maintains functional reserves of the body, which in turn affects the level of skill achievement. However, as many scientists note, the definition of optimal load as before remains one of the difficult problems in theory and practice of physical culture and sports [4,11].

J. L. Thompson, P. J. L. (2009), Haibach, P. S., Reid, G., & Collier, D. H. (2011) note features of influence on speed development of a sportsman, his coordination abilities and preparation of muscle apparatus to perform maximum intensity [15,16].

Ross, A and M Leveritt. (2001), Moir G., R. Sanders, C., C. B. and M. G. (2007) indicate that the effect isn't limited to the motor sphere but also concerns physiological processes [18.21]. Sheppard, J.M. and W.B. Young. (2006), Wilmore, J. H., Costill, D. L., & Kenney, W. L. (2008) consider the relationship of coordination abilities of a sportsman with motor amplitude disabilities [22.23].

Speed, agility and endurance of speed are decisive abilities that can affect performance. Running fast means owning while running your body, unlocking the flyweight movements.

The methodology of sports training on programs of special disciplines «Theory and methods of high qualification sportsmen' training» and «Foundations of theory and methods» gives an opportunity to plan work on improvement of mastery of the system of movements in the chosen sport, in particular sprint. Training programs are designed to improve sports results with appropriate technical training, which is aimed at mastering motor qualities. Implementation of step-by-step technical training by sportsmen is to automatism during trainings [6]. Sportsmen of high qualification need systemic unified training both technical and special, which takes into account improvement elements of motor exercises of adversarial nature. Athletics exercises, which are used in the period preparing for competitions, affect individual components of speed abilities: reaction speed, starting "explosive" reaction, speed of individual movements, speed of individual amplitude movements, increase of movement frequency, and increase of starting speed [19].

Analysis of scientific and methodological literature allows to state the fact that recently domestic and foreign authors in their works increasingly consider the use of athletics programs of special running exercises in training models, which are used for learning of running movements, correct foot setting, position of body and work of hands [14,17,20].

Using the special exercises of sportsmen are considered in researches of scientists: special preparatory exercises of I. Ter-Ovanensyan, 2000, V. Diukov, 2001, V. Kostyukevich 2007 [3,5,12]; preliminary exercises that promote the learning of form, movement techniques, A. Laputin, 1986, A. Tsios, 2002 [7]; simulation exercises that correspond to the coordination and kinematic structure of the performance of the chosen sport O. Gogin, 2010, G. Akhmetov, G. Maksimenko, T. Kutek, 2013 [1,2]. G Paradis researched preparation sprinters determined that for improves results in sprints 'sportsmen should spend less time during the start. So he recommended for the best result at sprint improve the speed of the starting reaction during speed training of athletes [24]. The researches of I.A. Ter-Ovanensyan justified methodological provisions concerning development and formation of abilities at a sportsman in the process of training of athletes. Using the elements of competitive actions during training classes with using the specially-preparatory exercises at maximum intensity of tempo, contributes to manifestation of laid-back abilities of a sportsman. Physical load of specified intensity with duty of variation develops body reserves functionally, which in turn is reflected at the level of increase of sports result [12].

For increase speed running programs of the strength training should be directed into decreases pennation angle of gastrocnemius muscle [25].

Determining the optimal load remains one of the difficult problems in the theory and practice of physical culture and sports. The optimal amount of load determines everything that the body's interaction with the environment should have in all its diversity. M. Lynets, V. Petrovskiy investigated physical exercises and the amount of load. The mode of propulsion activity, which is performed with maximum intensity and duration up to 15-22 seconds, refers to load of maximum power. This propulsion mode is provided by the generation of energy predominantly by oxygen-free creatine phosphate. Physical exercises of submaximal power are movements that are performed from 22-25 seconds to 3-4 minutes out of about the maximum intensity for the corresponding duration [8,10].

The effectiveness of the influence of physical exercises on the body of a sportsman is investigated in scientific works of M.M. Linets, V.V. Petrovskiy, K.V. Mykhailov where at other equivalent possibilities, the result of sports achievement will depend on the environment. For example, the result, which is shown indoors, has significant discrepancies with the result out-of-doors. In turn, performance of physical exercises in different ambient temperature conditions, with different intensity of solar irradiation, overcoming the wind force of the associated by a sprinter, counter has its differences [8,9,10].

Using the dosed optimal load in our research caused by significant individual and temporary variations of a sportsman's condition, as a result of which use of the same training load can lead to different body response and in turn to different training effect. The main difficulty of the problem in increasing sports skill lies in determining the optimum of required physical activity in the aspect of individual physical activity of each athlete. Taking into account the factor that each sportsman is inclined to constantly change the corresponding reaction to physical load depending on the degree of resumption after the previous training influence, the corresponding reaction of the musculoskeletal system of a sportsman, the degree of awareness, features of psychoemotional condition, and so on therefore a coach individually determines the degree of application of methods and means of influence on the athlete's body.

*Hypothesis.* It is planned to define the complex motor quality in the structure of motor actions of training and competitive activities of men sprinters in athletics relative to speed development. Thus, the purpose of this study was to determine the focus of trainings on the comprehensive application of running exercises aimed at the variable influence of motor quality

## Materials & methods

The subjects of this study were 12 athletes of high qualification of the group of the highest sports skill took part in the research. The participants of the research were divided into the experimental group (EG - 6 persons) and the control group (CG - 6 persons). Measurements were taken in training conditions. The sprinters age was  $18 \pm 0,5$  years. Level of development of speed abilities was determined by tests: running 30 m from

crouch start, running 60 m from crouch start, running 100 m from crouch start. All sprinters did three attempts the best result was taken into account. The research was approved by the Ethics Committee of Kharkiv state academy of physical culture and all subsequent procedures were consistent with the Helsinki Declaration.

The statistical analysis was carried out using the software package Statistica 10 (USA) and MS Excel 2016 (USA). We counted: visionary of the data research to the normal law (using the criterion of Kolmogorov-Smirnov); arithmetic average value; standard arithmetic mean error; validity of difference between average values (according to the Student's criterion).

During experiment trainings were held on repeated running on different distances, as well as a complex of preliminary and special exercises on speed to gradually increase speed abilities of runners by 100 meters of control and experimental groups. In the experimental group the method of repeated running on different length segments with submaximal intensity 81-90% of own achievement in the race on 100 meters was used. Duration of one exercise is 2-8 s. Number of repeats in one series is 3-4 times. Rest between repeats in one series is 2-4 min. Quantity of series is 2-4. Rest between series of repeats is 8-10 min.

The preparatory part used a large range of preliminary and special speed exercises, performing them in light and complicated conditions, using different simulators and devices.

The technique of trainings provided for two main methods of speed development: - multiple (up to 8-10 times) overcoming short segments of distance 30 meters and (up to 4-6 times) distance 60 meters from crouch start; - use of distances, flat and exceed the main (100-120 meters) (up to 2-4 times).

Speed of overcoming training segments of distance 30 meters and 60 meters increased in control starts to maximum intensity.

A sprinter's special exercise complex involved 26 exercises with application in a variable order. Non-traditional means were used to increase the level of speed-force preparation, in particular running with resistance and traction forward during the trainings of preparatory, basic periods. Resistance equal to 5-8% of own weight of athletes was used for sprint in complicated conditions. Sprint in light conditions helped the athlete to increase his maximum speed (gravity was 2-3 kg) running speed in light conditions was offered 0.5- 1 m/s above the individual maximum sprinter speed.

Exercises with competitive intensity were used mainly at the stage of entering into a sports form and in the competitive period.

**Results**

The results of indicators of speed abilities development at sprinters are presented in Table 1.

Table 1

**Indicators of the development level of speed abilities at sprinters during the study period (n = 12)**

Criteria, speed indicators	Groups	Before experiment	After experiment	Reliability assessment
		$\bar{x}_1 \pm m_1$	$\bar{x}_2 \pm m_2$	t; p
<b>Motor quality of training activity</b>				
Optimum speed				
Running 30 m from crouch start (s).	EG	4,15±0,02	4,05±0,03	t=7,56; p<0,001
	CG	4,18±0,01	4,15±0,01	t=3,95; p<0,01
		t=1,78; p>0,05	t=3,06; p<0,05	
Running 60 m from crouch start (s).	EG	7,08±0,03	6,92±0,03	t=10,96; p<0,001
	CG	7,15±0,01	7,12±0,01	t=8,22; p<0,001
		t=1,90; p>0,05	t=1,89; p>0,05	
<b>Motor quality of adversarial activity</b>				
Maximum speed				
Running 100 m from crouch start (s).	EG	10,95±0,03	10,67±0,03	t=7,36; p<0,001
	CG	10,98±0,02	10,91±0,02	t=9,70; p<0,001
		t=0,96 p>0,05	t=7,61 p<0,001	

Notes:

EG - experimental group

CG - control group

As a result of the analysis of the researched indicators, statistically significant changes were found in all results (p < 0.01-0.001), which indicates the effective impact of the applied training programs in both groups. At the same time, statistically significant differences between the secondary results of the control and experimental groups are in the tests: running on 30 m from crouch start p < 0.05, run on 100 m from crouch start p < 0.001-gives reason to claim the more effective impact of the experimental training program to increase the development level of speed abilities.

In order to determine the effectiveness of the programs used in the training of sprinters of experimental and control groups, increases in the development level of speed capabilities were calculated (Fig. 1, Fig. 2).

The analysis of the increase of the investigated indicators showed the most effective impact of the developed program on the results of running 100 meters from crouch start, the time of which decreased by 2.6%.

The least effectively developed sprinter training program affected the results of running 60 meters from crouch start, the time of which decreased by 2.3%.

The greatest increases in results were observed in run on 30 m from crouch start in the control group. After using the training program the distance running time decreased by 0.7%.

The least effective training program of the control group affected the results of the test running 60 meters from crouch start. After the application of the training program, the distance running time decreased by 0.4%.

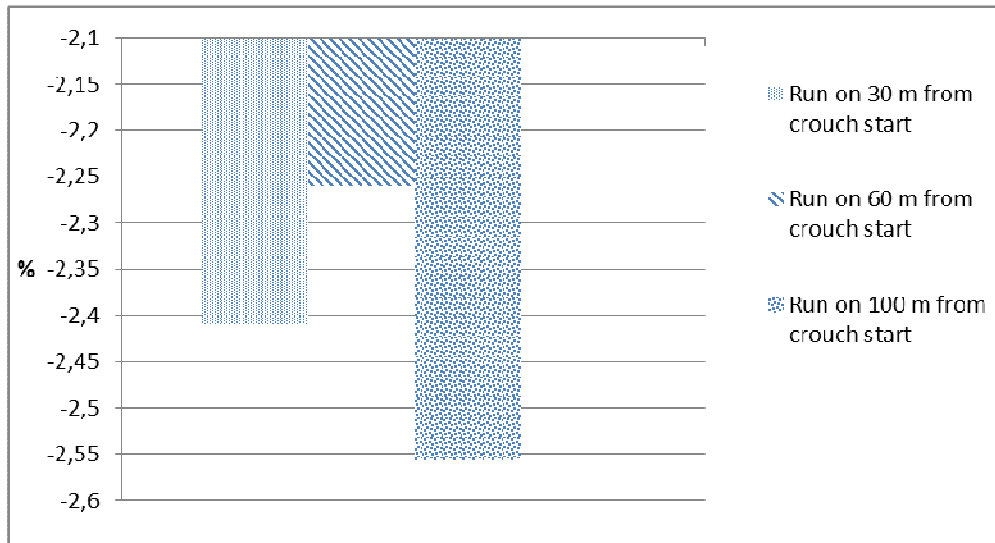


Fig. 1 Increase of indicators of the development level of speed abilities at sportsmen of the experimental group

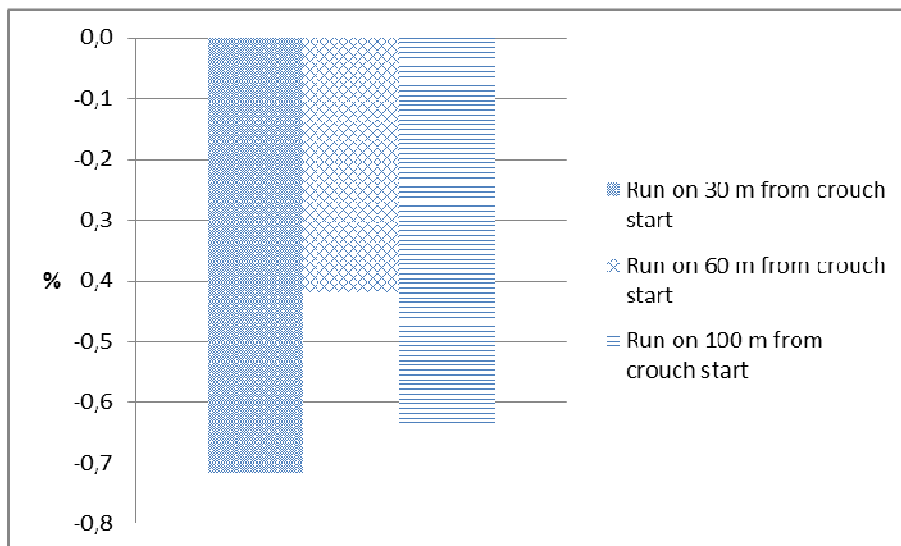


Fig. 2 Growth of indicators of the development level of speed abilities at sportsmen of the control group

Comparison of the gains of experimental and control groups revealed a more effective action of the training program of the experimental group. After the application of training programs, the increase in the results of the test of run on 30 meters from crouch start of the experimental group was large, in comparison with the control group by 1.7%. In the test run on 60 meters from crouch start, the increase in the results of the

experimental group exceeded the control group by 1.8%. The increase in the result of the test of running by 100 meters from crouch start of the experimental group exceeded the control group by 1.9%.

Thus, the method of conducting trainings on speed development, which was introduced in the experiment, indicates that overcoming short segments at the optimal speed at a given rate makes it possible to focus attention on the technique of running movements. Introduction of special running exercises at the preparatory part makes it possible to adjust the muscle apparatus for effective operability when overcoming running segments at maximum speed.

### Discussion

The obtained data confirmed the influence of coordination abilities of the athlete and preparation of muscle apparatus to fulfill maximum intensity [15,16].

Data on speed development of the sportsman is supplemented by a complex of special preliminary exercises, which contribute to learning of form and technique of movements [7].

Scientific data are supplemented on peculiarities of using the special exercises of sportsmen in the preparatory part of training. Carrying out trainings in the basic period with the use of unconventional means to increase the level of speed-force preparation, in particular running with resistance and speed running in light conditions [1,2,3,5,12].

The research found that a technique that provides for the formation of speed running skills at maximum intensity at segments isn't an effective means of learning the shape and technique of movements through excessive attachment of muscles.

In our opinion:

1) application of non-traditional means allows to intensify significantly the training process of sprinters, significantly increase the level of speed-force preparation with simultaneous development of motor skill;

2) it is advisable to use resistance even 5-8% of own weight of athletes for running in complicated conditions. This makes it possible to form a dynamic structure similar to the maximum speed running structure at a lower speed and to develop speed-force qualities directly in the structure of the competition exercise;

3) run in light conditions is especially effective for the development of maximum speed capabilities, gives the sportsman the opportunity to increase his maximum speed and in multiple repeats to "remember" it.

The results of the research are established that the method of carrying out trainings on speed development is applied correctly about what sports achievements of sportsmen of experimental and control groups testify. The determination of the effectiveness of the programs used in the training of sprinters, experimental and control groups shows tests of the growth of indicators of the level of development of speed abilities (see Fig. 1, Fig. 2).

By the results of the research it can be stated that the growth of the investigated indicators showed the most effective action of the developed training program affected the indicators of the test competitive result in run on 100 meters from crouch start.

However, the peculiarities of speed running in the distance: in particular the number of steps in the starting acceleration, the length and frequency of steps, the study wasn't taken into account, as noted by other researchers [2,6]. This needs to be clarified in the following researches.

### Conclusions

Using the right choice of training methods, use of different forms of special exercises of athletes, gives an opportunity to form motor actions which are aimed at improvement of motor quality. Overcoming short segments with optimal speed at a given pace makes it possible to focus attention on the technique of running movements. Carrying out trainings with the use of unconventional means in the basic period contributes to increasing the level of high-speed and power preparation of sportsmen.

The findings suggest established that for improvement of motor quality coach should introduction of special running exercises at the preparatory part makes it possible to adjust the muscle apparatus for effective operability when overcoming running segments at maximum speed.

During sprinter training should include running different length segments 30-60 m with submaximal intensity 81-90% of own achievement in the race on 100 meters. Duration of one exercise should be no more than 2-8 s. Number of repeats in one series 3-4 times. Rest between repeats in one series should be 2-4 min. Quantity of series is 2-4. Rest between series should be no more than 8-10 min.

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**Conflict of interest.** The authors declare that there is no conflict of interest.

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