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RESTRUCTURING OF SPECIAL PREPAREDNESS OF SPRINTERS WITH INCREASING OF SPOSTSMANSHIP

The results of the survey have provided the data about the structure of the special preparedness of sprinters of various qualifications, which indicate increasing of sportsmanship. The tools for training sprinters must be chosen in such a way as to ensure a positive interaction of the qualities of strength and speed in order to effectively perform the necessary motor task. There are informative tests for assessment of the level of speed-strength preparedness of sprinters. The usage of informative tests in practice can help to improve the effectiveness of the training process of sprinters.

Key words: *sportsmen, sprint, various qualifications, structure, exercises, preparedness, sports grade.*

Introduction. 100 and 200 m races are constant in the Olympic Games, World and Europe championships. Specialists for many years have accumulated a lot of materials about the training system of sprinters. It was proved that their training, from beginners to highly qualified athletes, is a multi-component system, all parts of which are in strict interaction. At the same time, each of the components solves its own specific range of tasks and therefore is relatively independent (Борзов, 2013; Врублевский и Мирзоев, 2006; Костюкевич, 2014; Семенов и Врублевский, 2000).

The motor specificity of the sports exercises demands great requirements of the special training of runners, since development of speed and power qualities of the sprinter is closely related to improvement of other motor skills (strength, speed, special endurance), general physical culture in the complex with formation of a rational technique of running (Врублевский, 2016, p. 34). The tools of special strength training take an important place in the system of sprinter sports training. This is due to the fact that these funds, firstly, are designed to ensure formation of such a structure of physical fitness of an athlete, which would meet the specifics

of the external relations of his body, and, secondly, must correspond to the mode of activity of an athlete in a specialized exercise (Борзов, 2013; Платонов, 2004; Семенов и Врублевский, 2000).

Nowadays, a great deal of methodological material has been accumulated on the use of various speed-strength exercises in trainings. However, the problem of choosing rational means of speed-strength training, especially their use in training with a different contingent of sprinters, hasn't received proper justification and theoretical explanation. The question of how speed-strength exercises influence preparedness of a sprinter, and as a result, his result in 100 and 200 m race, is also insufficiently covered in the scientific and methodological literature.

The purpose of our study was to determine the structure of speed-strength training in male sprinter of various qualifications and to identify its changes with increasing of sportsmanship.

Analysis of relevant research. At the present stage of development of sports training for sprinters, there is a growing need for effective principles for interconnection of leading physical qualities that ensure the skills (Врублевский и Мирзоев, 2006; Платонов, 2004; Cissik, 2005). A high level of speed-strength readiness is expressed in the results of jump tests, which are given by specialists to show one or another result. So, according to V. F. Borzov (Борзов, 2013, с. 78), a sprinter having a result at the level of the second sport level, should jump in length from 260 cm, a triple jump from his position should be 760 cm, a tenfold jump of 27 meters. Indicators in the same tests for a first-class sportsman, respectively, 0,2–0,5 and 4 meters more.

Short-distance race refers to cyclic types of exercise and is characterized by a relatively short duration of work at its maximum intensity (Врублевский, 2016; Врублевський и др., 2018). High power in the speed race is associated with a large expenditure of muscle and nervous energy on the part of the athlete. As a result, sprint race belongs to the group of speed-strength sports, performed with maximum intensity of work effort, which, as most experts say, requires a high level of speed-strength development for the continuous growth of sportsmanship. Moreover, the speed-power character of the work in the sprint begins with the first step, proceeds against the background of the developing acceleration of the body and serves as a means of creating an additional number of movements to the one that already exists (Борзов, 2013; Sandders, 2004). Speed in the sprint race is directly related to manifestation of another important quality – power. This leads to general reasons determining the adequacy of development of these physical qualities in a sprinter.

Therefore, as indicated by V. N. Platonov (Платонов, 2004, p. 56), the challenge of today's sport and today's physiology should be the establishment of fundamental relations between strength and speed and creation of ways to obtain individual characteristics of this relationship.

The high level of development of speed-strength qualities positively affects physical and technical preparedness of the students, their ability to concentrate on efforts in space and time (Борзов, 2013; Cissik, 2005). In the course of speed running, the sprinter repeatedly has to overcome the resistance of the body weight. This requires that the sprinter has a large manifestation of special strength in the muscles when running (Семенов и Врублевский, 2000; Sannders, 2004).

The power preparedness of the sprinters has a various degree of connection with the running speed on individual segments of the 100 m race. Thus, according to the data of V. V. Maslakova, E. P. Vrublevskiy and O. M. Mirzoeva (Маслаков, 2009, p. 34), the speed of running at the site of starting acceleration (0-30 m) does not depend on the forceful manifestations of the extensor muscles of the thigh and plantar flexors of the foot. The running speed in the area of the running speed (30–50 m) and its maximum characteristics (50–70 m) is associated with the strength of the extensor muscles of the thigh to a greater extent than with the strength of the plantar flexors of the foot.

In the area where the running speed is reduced (70–90 m), the significance of the relative explosive strength of the plantar flexors of the foot increases, and at the finish (90–100 m) the significance of all the power characteristics is equalized.

The effectiveness of running and jumping exercises, similar in structure to competitive ones, is due to the fact that they not only accentuate the speed-strength characteristics of the most important muscle groups in the sprint race, but also contribute to the formation of a rational technique of high-speed running movements.

Thus, experts unanimously believe that speed-strength training plays an important role in achievement high results in sprint. At the same time, the analysis of special literature shows that a large number of various exercises are used for the development of speed-strength qualities. But, according to V. M. Kostyukevich (Костюкевич, 2014, p. 99), none of the exercises can give the desired effect if there is no clear, proven and optimal system for organizing the use of certain special tools, taking into account the specifics of a particular type and individuality of an athlete.

Methods and organization of the study. The study was carried out in 2018 on the basis of the Junior sport school of Olympic reserve in Gomel. There were examined 35 sprinters of various qualifications with the help of pedagogical tests. Athletes who passed the survey were divided into three groups. The first group (average result 10.99 s) consists of sportsmen of the first-grade ($n = 9$). The second group (average result is 11.36 s) consists of the second-grade athletes ($n = 12$). The third group includes the third-grade athletes (average result is 11.69 s) of four people ($n = 14$).

The study was conducted in a competitive period during one day after the warm-up, which included slow running, general exercises, trial attempts, and run. The results were defined in the conditions close to real ones.

30 m race. Each athlete had two runs and the best one was chosen. The result was defined by a manual stopwatch.

Triple jump. Jumping was carried out on a track in the sand pit. Each athlete was given one trial and three test attempts. The result was determined by the best attempt and rounded down to one centimeter.

A two hands shot put weighing 7260 grams was performed from a segment in the standard sector for shot put. Each athlete was given one trial and three test attempts. The result was determined by a metal tape measure (P-20) at the best attempt and rounded up to one centimeter.

Bent over two-arm long bar. Each athlete had three approaches. The weight added by 0,5 kg. The best result was determined by the weight that was lifted by the athlete.

The results of the study and their discussion. The data of pedagogical testing, the mathematical and statistical analysis made it possible to find the differences during the formation of the sportsmanship of the sprinters (Table 1, Fig. 1-4).

The analysis of the presented results shows that the difference between the average values of fixed indicators among athletes of the III–I grade is not the same. So, as the result grows in the race for the main distance from the III–I grade, the average values in the bent over two-arm long bar increase by 13 %, and in the two hands shot put by 7,7 %. Moreover, it is noteworthy that the growth of sprinters from III to II grades is accompanied by an increase in the result in a triple jump only by 1 % ($p > 0.05$), and from II to I grades already by 8 % ($p < 0.05$).

It is also notable that this difference is also obvious in other indicators (Table 1), which may indicate a more accelerated increase in the results both in 100 m race and in fixed tests. And if the difference in the analyzed indicators

between the data of the sprinters of the II and III grade is mostly unreliable for the 5 % level of significance, then the statistical differences in the indicators of the sprinters of the I sports category ($p < 0.05$) differ from the indicators of the lower-skilled athletes in all characteristics ($t = 3,2 \div 4,8$).

Table 1

The average values (\bar{X}), the standard deviations (σ) and the coefficient of variation (V) of pilot indicators of sprinters III - I grade

Sports grade	Statistical indicators	Indicators				
		100 m race, s	30 m race, s	Shot put, m	Push jerk, kg	Triple jump, m
III-grade athletes	\bar{X}	11,69	3,31	12,63	63,6	8,22
	$\pm\sigma$	0,096	0,15	0,169	5,03	0,64
	V	0,8	4,5	1,3	8,0	7,7
II-grade athletes	\bar{X}	11,36	3,11	13,15	68,0	8,46
	$\pm\sigma$	0,15	0,11	0,25	2,79	0,23
	V	1,3	3,6	1,9	4,3	2,7
I-grade athletes	\bar{X}	10,99	2,83	13,63	73,4	9,31
	$\pm\sigma$	0,05	0,12	0,24	3,84	2,098
	V	0,5	3,5	1,8	5,3	22,8

According to the data in the table the highest variability (in terms of the coefficient of variation) is observed in athletes of the first-grade and it can be considered as an extension of individual fluctuations in the values of the analyzed characteristics. Moreover, the greatest heterogeneity of the array of initial values for all groups is observed according to the bent over two-arm long bar, and the smallest variation of indicators in 100 m race and a two hands shot put.

According to a number of authors (Костюкевич, 2014; Платонов, 2004), concepts of the structure of athletes' preparedness are crucial for organizing training in a particular sport and for selecting effective means, and, most importantly, methods for developing muscle strength. The solution of this question is impossible without the involvement of modern methods of mathematical-statistical processing of the data and, above all, the correlation analysis.

The correlation analysis was conducted to establish the relationship between a set of tests assessing the motor abilities of athletes and the result in running 100 m for sprinters of various grade and the changes of the structure of speed-strength preparedness as the sprinters' qualifications increase (Fig. 1-4).

The correlation analysis shows a high reliable correlation of the sports result with the following indicators (Fig. 1) 30 m race - $r_1 = 0,921$, triple jump - $r_2 = 0,810$, shot put - $r_3 = 0,853$, a bent over two-arm long bar ($r_4 = 0,560$).

If we look at the structure of speed-strength readiness in relation to three groups of grade, it is clear that as the result of sport grows, it changes (Fig. 2). Thus, in athletes of the III grade, the highest correlation of the sports result is observed with the result of 30 m race ($r_1 = 0,882$) and with the result of a triple jump ($r_2 = 0,908$).

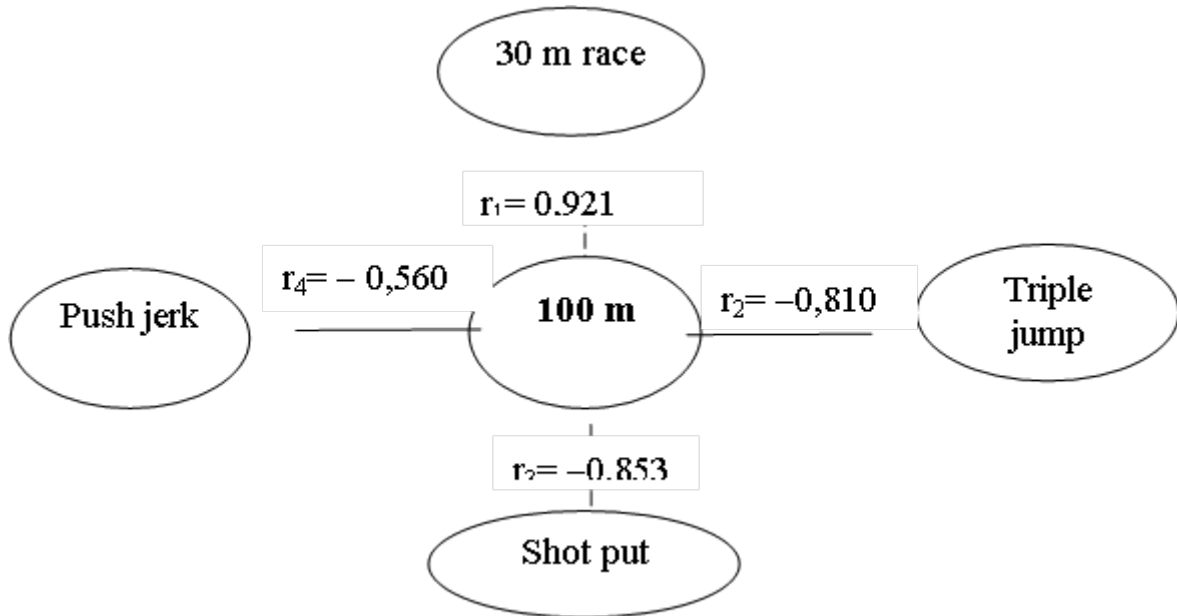


Fig. 1. The structure of speed-strength preparedness of sprinters of I-III grade

The correlation coefficient for such indicators as the push jerk and the shot put for this group of samples was unreliable for 5 % of the significance level.

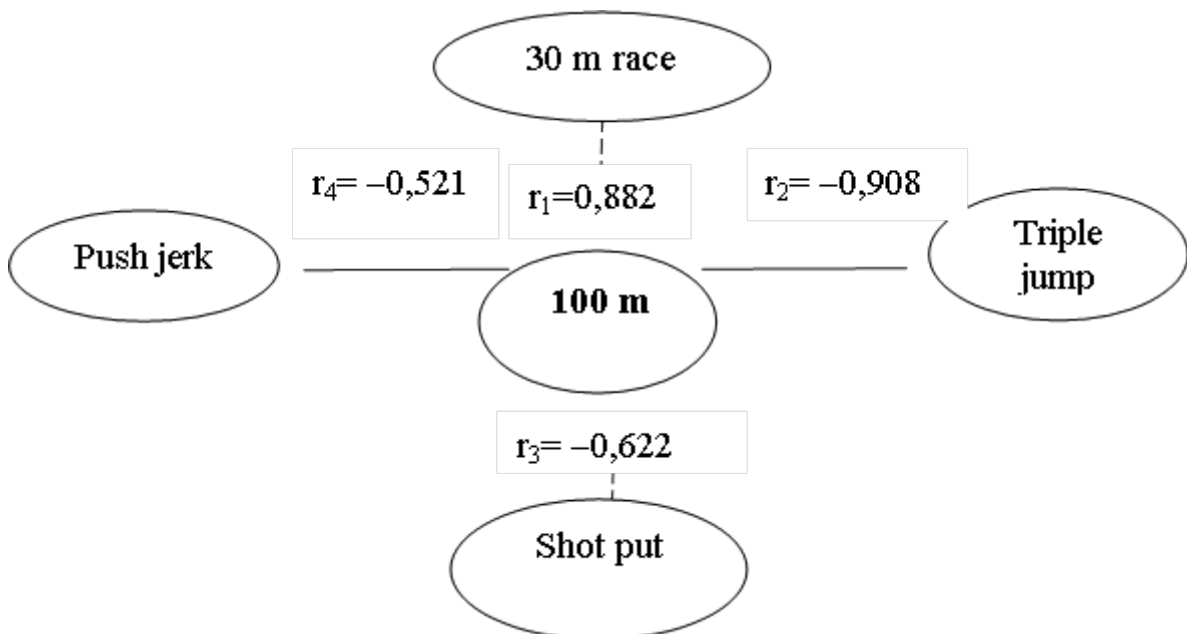


Fig. 2. The structure of speed-strength preparedness of sprinters of III grade

Approximately the same picture we can see analyzing the structure of speed-strength preparedness among athletes of the II grade (Fig. 3). The differences from the group of athletes of the III grade are in a smaller correlation of the result for the main discipline with the throw of the shot put ($r = 0,423$).

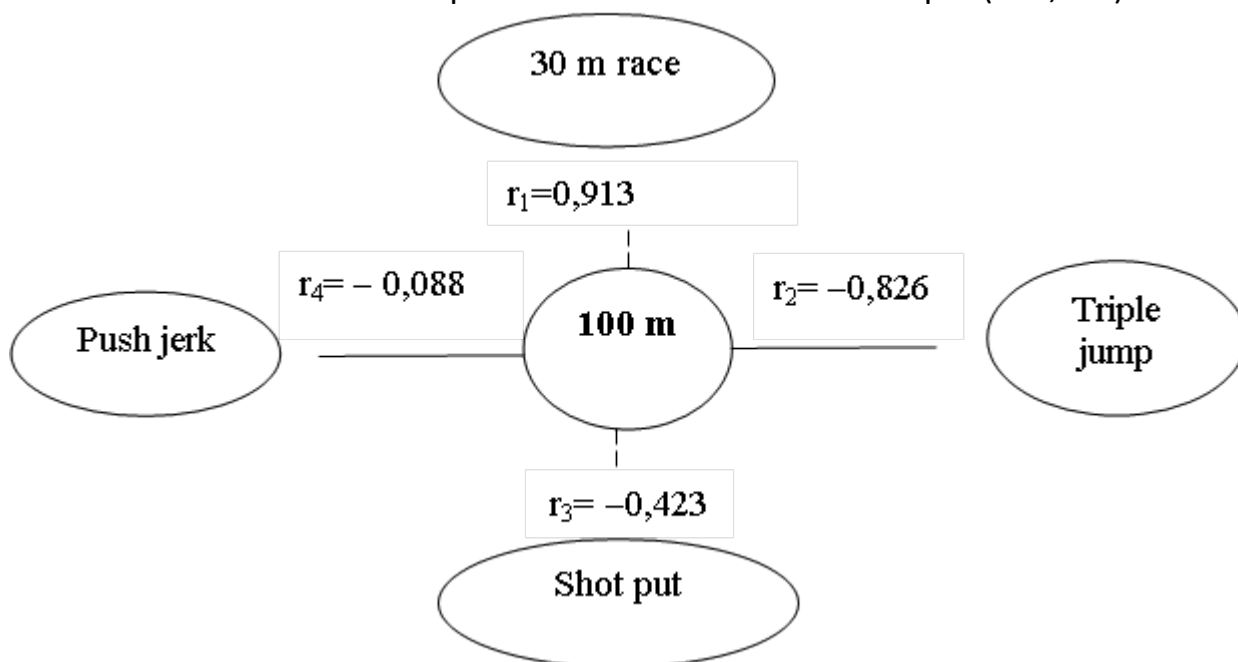


Fig. 3. The structure of speed-strength preparedness of sprinters of II grade

The speed-strength preparedness of the athletes of I grade is the following (Fig. 4). This group of runners has a high reliable ($p < 0.05$) relationship of a sports result with all fixing indicators, which may indicate the need to include all these indicators as means of speed-strength training.

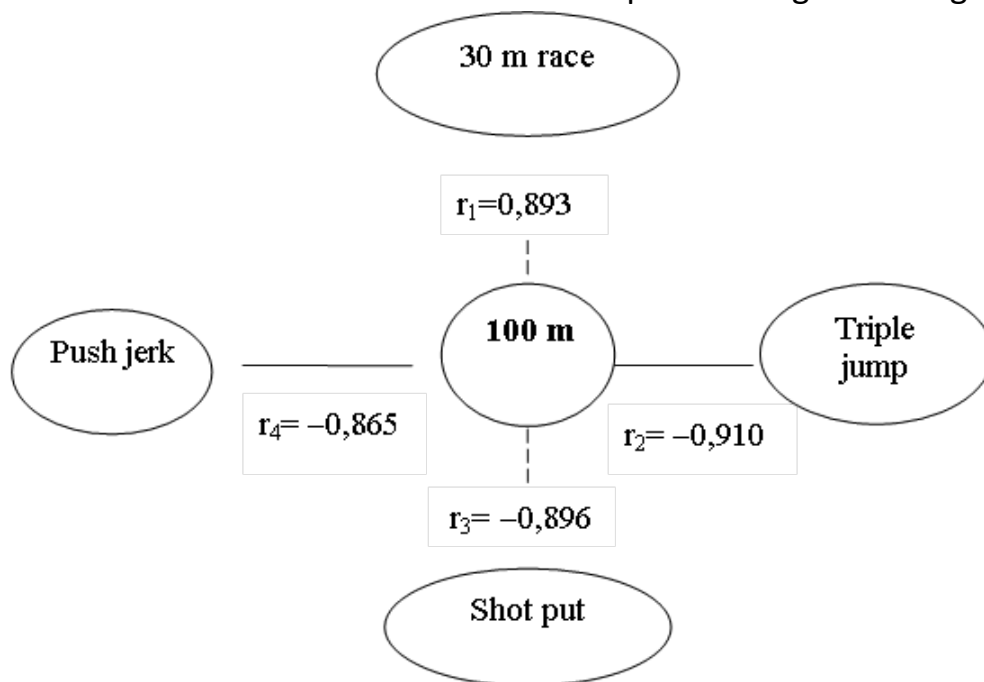


Fig. 4. The structure of speed-strength preparedness of sprinters of I grade.

One of the reasons for the low correlation with the result for the main distance, as a bent over two-arm long bar and a two hands shot put for runners of the III–I grade, seems to be the coordination complexity. Performing these exercises requires a certain speed-strength potential of the athlete's muscles.

The significant cumulative effect of speed-power indicators in 100 m race is also indicated by the obtained multiple correlation coefficient (R), which for runners of the III–I grade is equal to 0,859. The obtained coefficient shows that the combined effect of the indicators in the triple jump (y) and the bent over two-arm long bar (z) on the result in 100 m (x) race is quite significant.

The correlation analysis confirmed the fact that in order to achieve high athletic achievements in 100 m race, speed and strength training play an important role.

There are a lot of tests to determine the level of preparedness of sprinters. However, the choice of informative indicators for assessing speed-power indicators, despite its practical significance, is one of the most underdeveloped questions of the theory of sport (Платонов, 2004, p. 167). In order to simplify the presented material for the term "test", we adopted the definition proposed by L. P. Sergeenko (Сергієнко, 2011, p. 37), and the term "indicator" was understood as digital material obtained as a result of testing or mathematical calculations. The exercises should meet the following requirements: be simple and at the same time be complex, and evaluation of the results should be simple and convenient.

As a result of the study, the tests with information about the speed-strength qualities of sprinters of the III–I grade were identified and evaluated. A test for athletes of II and III grade is a triple jump, and for runners of the I grade are a triple jump, bent over two-arm long bar and a two hands shot. The evaluation of the reliability of tests using the "test-retest" method showed that the correlation coefficients ($r = 0,82 \div 0,91$) are quite high. It tells about their reliability (Сергієнко, 2011, p. 39).

The usage of metrologically validated tests in the training process can increase the effectiveness of preparedness of sprinters at a given qualification level.

Conclusion. The analysis of the special literature has shown that the issue concerning the structure of the speed-strength preparedness of the sprinters of the III–I grade is not examined properly. In this respect, the definition of this structure can be a potential reserve, contributing to the qualitative improvement of the speed-strength preparedness of sprinters.

It was investigated that increasing of sportsmanship of the sprinters is accompanied by a more accelerated increase in the fixed indicators as the result improves to the level of the I grade. So, if the difference in the analyzed indicators between the data of the sprinters of the II and III grade is mostly unreliable for 5 % level of significance, then the indicators of the runners of the I grade are statistically significantly ($p < 0.05$) different from the indicators of lower-skilled athletes in all characteristics ($t = 3,2 \div 4,8$). Moreover, for runners of the I grade, a higher variability of the analyzed characteristics is essential.

It is identified that the growth of qualifications of sprinters from III to I grade is determined by the level of development of their speed-strength preparedness. This is manifested in an increase in the relationship between the result in 100 m race and the indicators of two hands shot put (r from $-0,622$ to $-0,896$) and the push jerk (r from $-0,522$ to $0,865$). This is also evidenced by the coefficient of multiple correlation ($R = 0,859$), which proves the combined effect of the achievements in speed-strength tests on the result in 100 m race.

The data obtained on the structure of preparedness of sprinters of various grades confirm a number of studies that the means of speed-strength training for sprinters should be chosen in such a way as to ensure positive interaction of qualities of strength and speed with the aim of effective performance the necessary motor tasks.

The study revealed the informative tests for assessment of the level of speed-strength preparedness of sprinters of the I and III grade. The tests for sprinters of the II and III grade are triple jumps, and for the first-grade runners their special strength training can serve as indicators in a triple jump, two hands shot put and bent over two-arm long bar.

The usage of metrologically validated tests in the training process can increase the effectiveness of preparedness of sprinters at a given qualification level.

Prospects for further research are focused on the development of methods for special strength training of short-distance runners of various qualifications in the annual training cycle.

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РЕЗЮМЕ

Врублевский Евгений, Альбаркайи Дульфигар, Хоршид Ахмед. Изменение структуры специальной подготовленности бегунов на короткие дистанции с ростом спортивного мастерства.

Получены данные о структуре специальной подготовленности спринтеров различной квалификации, которые свидетельствуют о ее изменении по мере роста мастерства спортсменов. Последнее указывает, что средства подготовки бегунов на короткие дистанции должны подбираться таким образом, чтобы обеспечить положительное взаимодействие качеств силы и быстроты с целью эффективного выполнения необходимой двигательной задачи. Выявлены информативные тесты для оценки уровня скоростно-силовой подготовленности бегунов на короткие дистанции. Применение в практической деятельности метрологически обоснованных тестов может способствовать повышению эффективности тренировочного процесса спринтеров данной квалификации.

Ключевые слова: спортсмены, спринтерский бег, различная квалификация, структура, упражнения, подготовленность, спортивные разряды.

АНОТАЦІЯ

Врублевський Євген, Альбаркайі Дульфігар, Хоршід Ахмед. Зміна структури спеціальної підготовленості бігунів на короткі дистанції з ростом спортивної майстерності.

Питання про те, як впливають швидкісно-силові вправи на підготовленість спринтера, а в підсумку і на його результат з бігу на 100–200 метрів, є недостатньо висвітленим у науково-методичній літературі.

Мета дослідження – визначення структури швидкісно-силової підготовленості в чоловіків-спринтерів різної кваліфікації і виявлення її зміни зі зростанням майстерності спортсменів. Для вивчення структури підготовленості спринтерів за допомогою контрольних-педагогічних тестів обстежено 35 спринтерів (від III до I спортивного розряду).

Проведений кореляційний аналіз дозволив установити взаємозв'язок між комплексом тестів, що оцінюють рухові здібності спортсменів, і їх результатом з бігу на 100 м, а також зміна структури швидкісно-силової підготовленості зі зростанням кваліфікації спринтерів.

Установлено, що зростання кваліфікації спринтерів від III до I спортивного розряду значною мірою визначається рівнем розвитку їх швидкісно-силової підготовленості. Це проявляється в збільшенні взаємозв'язку між спортивним результатом з бігу на 100 м і показниками з метання ядра двома руками знизу вперед і ривку штанги. Про це саме свідчить отриманий коефіцієнт множинної кореляції ($R=0,859$) доводить спільний вплив досягнень у швидкісно-силових тестах на результат з бігу на 100 метрів. Останнє вказує, що засоби підготовки бігунів на короткі дистанції повинні підбиратися таким чином, щоб забезпечити позитивну взаємодію якостей сили та швидкості з метою ефективного виконання необхідної рухової задачі.

Виявлено інформативні тести для оцінки рівня швидкісно-силової підготовленості бігунів на короткі дистанції. Застосування в практичній діяльності метрологічно обґрунтованих тестів може сприяти підвищенню ефективності тренувального процесу спринтерів даної кваліфікації.

Перспективи подальших досліджень полягають у цілеспрямованій розробці методики спеціальної силової підготовки бігунів на короткі дистанції різної кваліфікації в річному циклі тренування.

Ключові слова: спортсмени, спринтерський біг, різна кваліфікація, структура, вправи, підготовленість, спортивні розряди.