

## Development of speed-strength abilities of 11-12 year old rugby players using a set of special exercises

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### Abstract

**Purpose:** to select and experimentally test the effectiveness of complexes of special exercises for the development of speed-strength abilities of rugby players at the stage of preliminary basic training.

**Material of the study:** the study involved 24 young athletes aged 11–12 years who trained at the stage of preliminary basic training.

**Research methods:** indicators of speed-strength abilities of 11-12 year old rugby players were determined using the following tests: 30 m run from a high start, standing long jump, triple jump, 30 m run with a ball, shuttle run (3x10 m), passing the ball in pairs.

**Results:** a different degree of correlation was established between the indicators of test exercises that were used to determine the speed-strength abilities of 11-12-year-old rugby players: between the results of tests of running 30 meters from a high start, standing long jump, a triple jump from a place and running to 30 meters with the ball, and between the 30 meters run with the ball and the shuttle run 3 x 10 meters - a significant relationship ( $r=0,712-0,817$ ). Between the results of standing long jump, a shuttle run of 3 to 10 meters and the number of ball passes on the spot in pairs, there is a low degree of manifestation ( $r = 0,309-0,455$ ). Between the indicators of other test exercises that were used in our study, a moderately pronounced relationship was established ( $r=0,499-0,674$ ).

**Conclusions:** the effectiveness of the use of complexes of special exercises for the development of speed-strength abilities of rugby players at the stage of preliminary basic training has been proven. Significant differences between the test results of the control and experimental groups were established: 30 m run, standing long jump, triple jump, 30 m run with the ball, passing the ball in pairs.

**Key words:** rugby, speed-strength abilities, educational and training process, special exercises.

### Анотація

**Розвиток швидкісно-силових здібностей регбістів 11-12 років з використанням комплексу спеціальних вправ.** Владлена Пасько, Олена Несен, Анатолій Цьось, Ірина Помещикова, Людмила Філенко, Олена Церковна, Наталія Долгополова.

**Мета:** підібрати та експериментально перевірити ефективність комплексів спеціальних вправ для розвитку швидкісно-силових здібностей регбістів на етапі попередньої базової підготовки.

**Матеріал дослідження:** у дослідженні приймали участь 24 юних спортсмени у віці 11–12 років, що тренувалися на етапі попередньої базової підготовки.

**Методи дослідження:** Показники швидкісно-силових здібностей регбістів 11-12 років визначалися за допомогою наступних тестів: біг на 30 м з високого старту, стрибок у довжину з місця, потрійний стрибок з місця, біг на 30 м з м'ячем, човниковий біг (3x10 м), передача м'яча на місці в парах.

**Результати:** встановлено різний ступінь вираженості взаємозв'язків між показниками тестових вправ, що використовувались для визначення швидкісно-силових здібностей регбістів 11-12: між результатами тестів бігу на 30 м з високого старту, стрибком у довжину з місця, потрійним стрибком з місця та бігом на 30 метрів з м'ячем, а також між бігом на 30 метрів з м'ячем та човниковим бігом 3 по 10 метрів - суттєвий взаємозв'язок ( $r=0,712-0,817$ ). Між результатами стрибків з місця, човникового бігу 3 по 10 метрів та кількістю передач м'яча на місці в парах - низький ступінь прояву ( $r=0,309-0,455$ ). Між показниками інших тестових вправ, що використовувались у нашому дослідженні було встановлено помірно виражений взаємозв'язок ( $r=0,499-0,674$ ).

**Висновки:** доведено ефективність застосування комплексів спеціальних вправ для розвитку швидкісно-силових здібностей регбістів на етапі попередньої базової підготовки. Встановлено достовірні відмінності між результатами тестів контрольної та експериментальної груп: біг на 30 м, стрибок у довжину з місця, потрійний стрибок з місця, біг на 30 м з м'ячем, передача м'яча в парах.

**Ключові слова:** регбі, швидкісно-силові здібності, навчально-тренувальний процес, спеціальні вправи.

### Introduction

A rationally organized process of sports training contributes to the harmonious development of various motor qualities

that are manifested in the chosen sport and determine the success of sports activities [1; 2].

It is known that the effectiveness of managing the process of sports training is possible only if there is a clearly organized and planned system of individual training of athletes and the team as a whole [3; 4; 5; 6]. Scientists note that the expansion of the arsenal and variety of physical activities aimed not only at the development of motor qualities, but also at the further improvement of technical and tactical skills, will provide an effective solution to the problems of sports training [7; 8; 9].

In recent years, such a sport as rugby has become increasingly popular in Ukraine [10; 11]. The specificity of the training and playing activities of rugby players requires the manifestation of speed-strength qualities and a sufficiently high level of their endurance [12; 13].

It is known that the growth of sportsmanship of athletes-players largely depends on the level of development of their speed-strength qualities, which, moreover, are closely interconnected with the skill level of athletes and their game role [14; 15; 16; 17].

Rugby is one of the most difficult team sports that combines the complexity of the technical elements of the game with a high intensity of motor actions in the confrontations of rivals [12; 18; 19]. This is explained by the fact that the motor activity of athletes combines speed-strength endurance with a long-term effect of normobaric hypoxia [10, 11].

Training of rugby players at the stage of preliminary basic training, as well as representatives of other sports [20; 21; 22] should provide the prerequisites for the disclosure of sportsmanship at the next stage of a long-term sports path. The main goal of this stage is the formation of a young rugby player, the formation of his comprehensive technical and tactical training, sustainable motivation for rugby. The main objective of the stage of preliminary basic training is the versatile development of the physical capabilities of the body, health promotion, elimination of shortcomings in physical development and physical fitness, increasing motor potential.

Versatile training at this stage, using a small amount of specific exercises, is more conducive to further athletic improvement than specialized training. Technical improvement is based on various modern rugby programs. At this stage, rugby players should have a good grasp of rugby techniques. This approach develops in them the ability to quickly assimilate both individual and group techniques, and further provides the ability to use different techniques depending on tactical tasks. Particular attention is directed to the development of various forms of manifestation of speed, coordination qualities and flexibility.

In sports science and training, the practice of using special sets of exercises and training programs to solve specific training issues has found its significant place. Thus, some authors suggest using aerobic complexes to improve the physical qualities of volleyball players at the stage of specialized basic training [23]. Others recommend using overload stimulators specific for strength and speed in strength training [24] and in their work prove the effectiveness of using strength-speed imbalance to increase physical performance [25]. So, many authors offer various training programs for rugby players to address the issues of technical and physical training at different stages of sports training [26; 27, 28].

It should be noted that the use of new sets of exercises of different intensity to achieve various tasks of sports training must be developed taking into account the characteristics of recovery processes [29, 30].

Given the above, it is important to create the prerequisites for improving the qualitative and quantitative characteristics of the competitive activity of rugby players. This requires

improving the individual athletic fitness of athletes with an emphasis on increasing the level of speed-strength qualities.

**Purpose of the study:** to select and experimentally test the effectiveness of complexes of special exercises for the development of speed-strength abilities of rugby players at the stage of preliminary basic training.

## Materials and Methods

*Participants.* The experiment involved 24 rugby players aged 11-12 years. According to the results of primary testing of the level of development of speed-strength abilities, athletes were divided into control (12 people) and experimental (12 people) groups, taking into account the lack of significance of differences in the studied indicators ( $p > 0,05$ ). All participants gave informed consent to participate in this experiment.

*Procedure (organization of the study).* After receiving the initial indicators of the speed-strength abilities of rugby players aged 11-12, the degree of their interconnection was established, sets of exercises were selected and a plan was drawn up for their use in the educational and training process of the athletes of the experimental group. Indicators of speed-strength abilities of 11-12 year old rugby players were determined using the following tests recommended by the training program for youth sports school [31]: 30 m run from a high start, seconds; standing long jump, cm; triple jump, cm; 30 m run with a ball, seconds; shuttle run (3x10 m), seconds; passing the ball on the spot in pairs, number of times.

The next stage was a formative pedagogical experiment, lasting 9 weeks, the essence of which was to supplement the content of the training process of the rugby players of the experimental group with specially selected running and jumping exercises using a high-speed horizontal ladder in a standing position and lying down.

The total workload of both the rugby players of the experimental and the athletes of the control group was 12 hours a week (4 workouts of 135 minutes each), which meets the regulatory requirements of the rugby program for children and youth sports schools, specialized children and youth schools of the Olympic reserve, schools of higher sportsmanship and specialized educational institutions of a sports profile for athletes of this age and qualification [31]. The main material of the training program for special physical training for athletes of both groups consisted of performing 5-10 m accelerations from various initial positions, with the ball lifting from the ground and their correct dribbling; running at the highest pace for 30-40 m with the implementation of technical exercises; feints with stuffed balls in hands; various jumps, movements with a change in direction and speed of movement, shuttle running with exercises with the ball; game tasks in difficult conditions (on the sand).

The amount of training load in minutes allocated for special physical training of rugby players of both groups was the same. Distinctive were the duration of the above exercises and the athletes of the experimental group additionally (within the time of special physical training) performed the complexes we offer.

The use of experimental sets of exercises was planned in the preparatory period of the annual training cycle for athletes over 2 basic mesocycles, the tasks of which were to develop speed-strength abilities, coordination, improve ball handling techniques (receiving and passing), teaching techniques to keep the ball during contact with an opponent and further continuation of the game, teaching the technique of "capture" - stopping the opponent in possession of the ball in a permitted

way).

The content of the training of the rugby players of the experimental group, which differed from the athletes of the control group, consisted of the following sets of exercises for the development of speed-strength abilities: jumping and running exercises using a high-speed horizontal ladder in a standing position and lying down. The length of the speed ladder that was used during the pedagogical experiment was 5 meters (10 sections). Approximate distribution of training means for rugby players of the experimental group is shown in Table 1.

The time of application of the proposed exercises and the intensity of their implementation tended to increase in each subsequent training microcycle.

Examples of tasks on a horizontal ladder: 1) a block of jumping exercises from a standing position: jumps on one leg with a landing in each section / through the section; jumping into each section and beyond on two legs with different angles of flexion of the joints of the lower extremities and torso; the same, holding stuffed and rugby balls in different positions; 2) a block of jumping exercises from the prone position: from the starting position, the prone position is jumping, pushing off with your hands, landing in each section; the same with landing in the section and beyond; the same with the support of one hand on the rugby ball; 3) a block of cross-country exercises: running in each section raising your knees high; running in and out of

the section in different ways (with one foot into the section and behind it / with both feet into the section and behind it) moving forward; running in and out of the section on the spot, then accelerating and lifting the rugby ball, which lies at a distance of 4-5 meters in front / behind the athlete.

Performing the exercises required a gradual increase in the pace of their implementation, that is, reducing the time of one passage of the speed ladder.

*Statistical analysis.* The study results were processed using the Statistica package. Characteristics of descriptive statistics (arithmetic mean and standard deviation) were determined. The calculation of the Pearson correlation coefficient was carried out to establish the relationship between the indicators of test exercises that determined the speed-strength abilities of young rugby players. The significance of differences in mean values was assessed by the Mann-Whitney U-test, the difference was considered significant at ( $p < 0,05$ ).

## Results

The results of performing test tasks to determine the speed-strength qualities of rugby players of the experimental and control groups before the beginning of the experiment are shown in Table 2, from which it can be seen that the performance of athletes from both groups did not have significant

**Table 1. Distribution of training means of rugby players of the experimental group**

Training mesocycle, duration of training loads, min	Technical and tactical training, min	Physical training (SPP and GPP)		The orientation of the proposed sets of exercises and the time of their application, minutes	
		Main material	Application of the proposed sets of exercises, min		
Basic, 2430	855	1090	485	jumping exercises on a horizontal ladder in a standing position	200
				jumping exercises on a horizontal ladder in the supine position	200
				running exercises on a horizontal ladder	85
Basic, 2430	950	945	535	jumping exercises on a horizontal ladder in a standing position	180
				jumping exercises on a horizontal ladder in the supine position	235
				running exercises on a horizontal ladder	120

**Table 2. Indicators of speed-strength qualities of rugby players 11-12 years old in the control and experimental groups before the experiment ( $n_1=n_2=12$ )**

Indicators	Control group	Experimental group	Statistical indicators	
	$\bar{X} \pm \sigma$	$\bar{X} \pm \sigma$	U-test	p-value
Running 30 m from a high start, s	5,61±0,26	5,63±0,28	70,00	0,93
Standing long jump, cm	180,5±2,3	180,4±2,4	71,50	0,97
Triple jump, cm	549,7±16,7	541,5±8,4	53,00	0,29
Running 30 m with the ball, s	5,99±0,15	5,97±0,19	63,50	0,62
Shuttle run (3x10 m), s	8,02±0,13	7,00±0,12	62,00	0,58
Passing the ball in pairs for 1 minute, the number of times	25,3±0,9	25,2±0,7	70,00	0,93

Table 3. Interrelation of indicators of speed-strength abilities of 11-12 year old rugby players (r) (n=24)

	Standing long jump, cm	Triple jump, cm	Running 30 m with the ball, s	Shuttle run (3x10 m), s	Passing the ball in pairs for 1 minute, the number of times
Running 30 m from a high start, s	<b>-0,712</b>	<b>-0,713</b>	<b>0,817</b>	<b>0,584</b>	<b>-0,558</b>
Standing long jump, cm		<b>0,540</b>	<b>-0,674</b>	<b>-0,512</b>	0,339
Triple jump, cm			<b>-0,654</b>	<b>-0,499</b>	0,309
Running 30 m with the ball, s				<b>0,763</b>	<b>-0,586</b>
Shuttle run (3x10 m), s					<b>-0,455</b>

\*at n= 24;  $r_{cr} \geq 0,42$ ,  $p < 0,05$ ;  $r_{cr} \geq 0,54$ ,  $p < 0,01$ ;  $r_{cr} \geq 0,65$ ,  $p < 0,001$ ;

Table 4. Indicators of speed-strength qualities of rugby players 11-12 years old in the control and experimental groups after the experiment ( $n_1=n_2=12$ )

Indicators	Control group	Experimental group	Statistical indicators	
	$\bar{X} \pm \sigma$	$\bar{X} \pm \sigma$	U-test	p-value
Running 30 m from a high start, s	5,56±0,16	5,38±0,19	<b>36,00</b>	<b>0,04</b>
Standing long jump, cm	183,0±1,7	184,3±0,8	<b>36,00</b>	<b>0,04</b>
Triple jump, cm	568,5±8,5	574,6±6,8	<b>35,00</b>	<b>0,03</b>
Running 30 m with the ball, s	5,95±0,08	5,86±0,08	<b>34,00</b>	<b>0,02</b>
Shuttle run (3x10 m), s	7,97±0,08	7,92±0,06	43,00	0,10
Passing the ball in pairs for 1 minute, the number of times	25,9±0,9	26,8±0,9	<b>36,00</b>	<b>0,04</b>

differences ( $p > 0,05$ ).

Analyzing the relationship between the indicators of test exercises that were used in this study to determine the speed-strength abilities of 11-12 year old rugby players, the presence of different degrees of their severity was established (Table 3)

Thus, between the results of tests of running 30 meters from a high start and a standing long jump, a triple jump, a run of 30 meters with a ball, a significant relationship was established ( $r = 0,712-0,817$ , at  $p < 0,001$ ). A significant close relationship was established between a 30-meter run with a ball and a standing long jump, a triple jump and a 3x10-meter shuttle run ( $r = -0,674, -0,654, 0,763$ , respectively, at  $p < 0,01$ ).

Between the indicators of running 30 meters from a high start and a shuttle run of 3x10 meters and passing the ball in pairs for 1 minute, between a standing long jump and a triple jump, between running 30 meters with the ball and passing the ball in pairs, a moderately pronounced relationship ( $r=0,540-0,586$ , at  $p < 0,01$ ). Between the shuttle run of 3x10 meters and the standing long jump, triple jump and passes in pairs for 1 min, a significant correlation of the average manifestation was established ( $r = 0,455 - 0,512$ , at  $p < 0,05$ ).

At the same time, although there was a relationship between the number of ball passes in place in pairs and the results of standing long jumps and triple jumps, it had a low degree of manifestation and was not reliable ( $r=0,309, 0,309$ ).

After 9 weeks of the pedagogical experiment, during which the educational and training process of the rugby players of the experimental group was supplemented with specially selected exercises, the indicators studied by the rugby players of the control and experimental groups were retested.

Analyzing the data obtained after the experiment (Table

4), it was found that between the indicators of the control and experimental groups there are significant differences in a number of indicators ( $p < 0,05$ ).

If at the beginning of the study, the reliability between the results of the control and experimental groups were not established ( $p > 0,05$ ), then after the pedagogical experiment the results of the experimental group were significantly better ( $p < 0,05$ ) in running 30 meters from a high start (by 0,18 s), in the standing long jump (by 1,3 cm), in the triple jump (6,1 cm), in the 30 m run with the ball (by 0,09 s) and the number of ball passes in pairs in 1 minute (by 0,9 times).

So, the use in the process of sports training of 11-12-year-old rugby players of complexes of special exercises for the development of speed-strength abilities, expanding the arsenal of those exercises that are offered by the rugby program for children's and youth sports schools, specialized children's and youth schools of the Olympic reserve, schools of higher sports skills and specialized educational institutions of a sports profile allow to achieve a greater increase in the studied indicators.

## Discussion

The obtained differences in speed-strength indicators at the end of the experiment testify to the feasibility of introducing complexes of special exercises in the educational and training process of 11-12 year old rugby players. These results confirm the study by Bykova O. et al. [3, 21]. The authors indicate that the development of speed-strength and coordination qualities with the use of certain sets of exercises will help improve their game activity. The use of a special program of preparation for competitions based on the use of special exercises significantly



improved the state of physical fitness of handball players in the experimental group ( $p < 0,05$ ). Nesen Olena and others came to similar conclusions, in their studies pointing to the improvement of the technical skills of players based on the development of speed-strength abilities [32]. Tropin Y, etc. developed training tasks to improve the methods of special physical training of wrestlers, taking into account their wrestling styles. The proposed program was tested in a pedagogical experiment that lasted one year. The fulfillment of the developed training tasks by the wrestlers of the experimental group allowed at the end of the experiment to show significantly better results in terms of special physical fitness than the athletes of the control group ( $p < 0,05-0,01$ ) [33]. Tomas T. Freitas and others. [34] achieved positive changes in speed-strength readiness for two different training programs. In the studies of Pasko V. et al. [13], the rational structure and content of the speed-strength training of rugby players in the preparatory period was substantiated and developed. A complex methodology for conducting speed-strength training allows you to more effectively (according to the phenomenon of "contrast" of the impact of various means in one training session and the cumulative effect from training to training, which further affects the training effect) and rationally (by the distribution of hours) to increase the level of speed-strength preparedness of team players. The use of the proposed approach led to a significant improvement in the indicators of speed-strength qualities, in particular, the explosive and speed strength of the athletes of the experimental group ( $p < 0,05$ ).

Tim J. Gabbett and others. [35] note that there is a significant influence of the level of development of explosive speed, speed endurance and strength of qualified rugby players on their technical skills and efficiency of playing activity. In our study, a set of special exercises with a certain volume and intensity was used. Its use contributed to an increase in the speed and strength indicators of rugby players aged 11-12.

In the studies of Kozina Zh.L and others. [36], it was found that when teaching the basic techniques in handball, one should focus not only on the spatio-temporal parameters of technical movements, but also on the speed-strength aspect of their implementation. In our studies, specially selected running and jumping exercises were used using a high-speed ladder in a standing position and lying down, which had a positive effect on the development of speed-strength abilities of 11-12 year olds rugby players.

The authors of Bolotin Alexander & Bakayev Vladislav argue that in order to increase the effectiveness of the training process of young football players, the most effective means should be used to develop the speed-strength qualities of young football players. This requires the development of appropriate teaching methods, which is confirmed by our research [1].

The effectiveness of the use of physical exercises, which

in their structure, the nature of the work of the muscles and the mode of energy supply, correspond to the characteristics of competitive activity, which was shown as a result of our research, is reflected in the works of Josan I.A., Strikalenko E.A. & Shalar O.G.. The authors point out the existence of a significant relationship between the game functions of athletes and the manifestation of their speed-strength abilities [37]. Zankovets V.E. & Popov V.P. in turn, indicate a significant transfer of the effectiveness of exercises to the development of strength, speed and speed-strength abilities in various conditions of their manifestation [38].

The use of new sets of exercises in the training process using modern sports equipment, described in our study, finds support in the works of other authors [26, 30, 39, 40]. Thus, Gülşah Şahin, Mehmet Aslan & Erdal Demir in their work propose to improve the strength and speed-strength abilities of athletes by exercises with overcoming the resistance of a rubber band [8]. Özkan Çdmenlđ, Hümmüz Koç, Fatma Çdmenlđ & Celil Kaçođlu focus the reader's attention on the effectiveness of pleometric exercises to increase the jumping ability of volleyball players [18]. Karatnik I.V., Hrechanyuk O.O., Bubela O.Y. & Pityn M.P. offer 3 options for alternating training modules in badminton training, which are aimed at: 1) development of speed 2) development of strength 3) development of jumping ability [14].

Our data on the presence of correlations of varying severity are confirmed in the work of Ashcroft P. [20], Toma's T. et al. [41] and others. The authors point to the presence of strong relationships between the strength, speed-strength and speed indicators of rugby players and recommend that practitioners use multifaceted training schemes with young rugby players, including various components of endurance, speed-strength and strength training.

Our studies are confirmed by the results of the authors' studies [5, 8, 33], which indicate that the use of complexes of special exercises in the training process of athletes will further contribute to the improvement of special physical preparedness.

## Conclusions

The effectiveness of the use of complexes of special exercises for the development of speed-strength abilities of rugby players at the stage of preliminary basic training has been proven. Significant differences between the test results of the control and experimental groups were established: 30 m run, standing long jump, triple jump, 30 m run with the ball, passing the ball in pairs.

**Conflict of interest.** The authors declare that there is no conflict of interest that could be perceived to prejudice the impartiality of the article.

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