



# Method for the development of physical qualities of tennis players 12-13 years old using react balls and stretching

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## Abstract

**The purpose** – to develop and experimentally substantiate the method of developing the physical qualities of tennis players aged 12–13 years old, using React Balls and stretching.

**Material and methods.** The experiment was attended by 28 tennis players 12-13 years old sport school № 3, Severodonetsk, who were divided into control and experimental group of 14 people. The study was conducted within 8 months from August 2018 to March 2019. Before and after the experiment, tennis players' physical fitness was tested (shuttle run 6x8 m, push-ups 30 s, jumps with skipping-rope, running 6 m, running 30 m, long jump from the spot, throwing ball 1 kg, torso inclination forward from a sitting position, circular rotations in the shoulder joint with a gymnastic stick).

**Results.** Complexes of exercises with React Balls and stretch exercises for all muscle groups were developed and introduced into the training process of young tennis players. A significant ( $p < 0.05$ ) increase in the flexibility indicators of athletes from the experimental group, as a result of the use of stretch exercises, was determined. It was revealed that doing exercises with React Balls and tennis balls significantly ( $p < 0.05$ ) increased the level of speed and coordination capabilities in the control and experimental groups. According to the test results «running 30 m», «circular rotations in the shoulder joint with a gymnastic stick», «torso inclination forward from a sitting position» in the experimental group, these figures are significantly higher compared with the athletes of the control group.

**Conclusions.** It was shown that the use of stretching exercises contributes to the development of greater amplitude of movements, and also forms motor freedom, which affects the development of coordination and speed of movement of a tennis player. It is recommended to use the method of development of physical qualities using React Balls and stretching balls in the training process of young tennis players 12-13 years old.

**Keywords:** tennis; physical qualities; stretching; react balls; physical fitness; stretching exercises

## Анотація

**Собко І.М., Колесов О.В., Улаєва Л.О. Методика розвитку фізичних якостей тенісистів 12-13 років з використанням реакуючих м'ячів та стретчингу**

**Мета роботи** – розробити та експериментально обґрунтувати методику розвитку фізичних якостей тенісистів 12-13 років, з використанням реактивних м'ячів і стретчингу.

**Матеріал і методи.** В експерименті взяли участь 28 тенісистів 12-13 років КДЮСШ №3 м.Сєвєродонецьк, які були розділені на контрольну та експериментальну групу по 14 чоловік. Дослідження проводилося протягом 8 місяців з серпня 2018 по березень 2019 року. До і після експерименту було проведено тестування фізичної підготовленості тенісистів (човниковий біг 6x8м, згинання розгинання рук в упорі лежачи за 30 с, стрибки зі скакалкою за 1 хв, біг 30 м, біг 6 м, стрибок у довжину з місця, метання набивного м'яча, нахил тулуба вперед з положення сидячи, викрутив з гімнастичною палицею).

**Результати.** Розроблено і впроваджено в тренувальний процес юних тенісистів комплекси вправ з реактивних м'ячів і стретчингу для всіх груп м'язів. Визначено достовірне ( $p < 0,05$ ) збільшення показників гнучкості спортсменів експериментальної групи, в результаті застосування стретч-вправ. Виконання вправ з реактивних м'ячів і з тенісними м'ячами достовірно ( $p < 0,05$ ) підвищило рівень швидкісних і координаційних можливостей в контрольній та експериментальній групах. За результатами тестів «біг 30 м», «викрутитися з гімнастичною палицею», «нахил тулуба вперед з положення сидячи» в експериментальній групі дані показники достовірно вище в порівнянні зі спортсменками контрольної групи.

**Висновки.** Показано, що застосування вправ на розтягування сприяє розвитку більшої амплітуди рухів, а також формує рухову свободу, що відбивається на вихованні координації і швидкості пересувань тенісиста. Рекомендовано використання методики розвитку фізичних якостей із застосуванням м'ячів реактивних м'ячів і стретчингу в тренувальному процесі юних тенісистів 12-13 років.

**Ключові слова:** теніс; фізичні якості; стретчинг; реактивні м'ячі; фізична підготовленість; стретч-вправи

## Аннотация

**Собко И.Н.1, Колесов О.В., Улаева Л.О. Методика развития физических качеств теннисистов 12-13 лет с использованием реактивных мячей и стретчинга**

**Цель работы** – разработать и экспериментально обосновать методику развития физических качеств теннисистов 12-13 лет, с использованием реактивных мячей и стретчинга.

**Материал и методы.** В эксперименте приняли участие 28 теннисистов 12-13 лет КДЮСШ №3 г. Северодонецк, которые были разделены на контрольную и экспериментальную группу по 14 человек. Исследование проводилось в течении 8 месяцев с августа 2018 по март 2019 года. До и после эксперимента было проведено тестирование физической подготовленности теннисистов (челночный бег 6x8м, загибание разгибание рук в упоре лежа за 30 с, прыжки со скакалкой за 1 мин, бег 30 м, бег 6 м, прыжок в длину с места, метание набивного мяча, наклон туловища вперед из положения сидя, выкрут с гимнастической палкой).

**Результаты.** Разработаны и внедрены в тренировочный процесс юных теннисистов комплексы упражнений с реактивными мячами и стретч-упражнений для всех групп мышц. Выявлено достоверное ( $p < 0,05$ ) увеличение показателей гибкости спортсменов экспериментальной группы, в результате применения стретч-упражнений. Выявлено, что выполнение упражнений с реактивными мячами и с теннисными мячами достоверно ( $p < 0,05$ ) повысило уровень скоростных и координационных возможностей в контрольной и экспериментальной группах. По результатам тестов «бег 30 м», «выкрут с гимнастической палкой», «наклон туловища вперед из положения сидя» в экспериментальной группе данные показатели достоверно выше по сравнению со спортсменками контрольной группы.

**Выводы.** Показано, что применение упражнений на растягивание способствует развитию большей амплитуды движений, а также формирует двигательную свободу, что отражается на воспитании координации и скорости передвижений теннисиста. Рекомендовано использование методики развития физических качеств с применением реактивных мячей и стретчинга в тренировочном процессе юных теннисистов 12-13 лет.

**Ключевые слова:** теннис; физические качества; стретчинг; реактивные мячи; физическая подготовленность; стретчинг



## Introduction

High performance in sports depends on the health status of an athlete, the characteristics of his physique, level of physical and motor fitness, coordination abilities associated with the development of physical qualities. Of particular importance for an athlete is the success of learning applied motor skills and skills, and the formation of technique. Tennis belongs to the type of sports games that combine versatile athletic abilities, psychological content and emotional struggle, aesthetics of movements and a high level of entertainment effect [1]. Tennis requires a sportsman to develop high coordination abilities (especially the differentiation of spatial-temporal parameters of movements and accuracy of movements), strength abilities (especially speed strength), speed abilities (to a greater degree of starting speed and speed in complex motor reactions), aerobic abilities (matches can occur from 1 to 4 hours), flexibility in the joints (especially in the hip and shoulder joints), functionality (especially the function of the visual analyzer), intelligence abilities [2]. From this it follows that the process of training qualified athletes is an urgent task of the entire coaching corps.

The whole perennial process of sports training in tennis has a complex dynamic structure, which includes a wide range of different pedagogical influences, diagnostics of athletic abilities, and adequate use of the means, methods and forms of the teaching and educational process. The relevance of education, development and improvement of various aspects of athletes' preparedness cannot be overestimated. It is due to the need to have information on maintaining a high level of performance in extreme competitive conditions, the effectiveness of technical and tactical actions, predicting a player's noise immunity in a competitive fight, and developing methods for the effectiveness and sustainability of their activities [1].

Modern scientific researchers discuss various aspects of the sports activities of tennis players of various qualifications [3-5]. Many works are devoted to the issues of psychological preparation of tennis players [6-7]. The authors emphasize that psychological training should become an integral part of the whole training process when working with young athletes, provided that they have an adequate choice of means and methods, taking into account the age and individual characteristics of children. The scientist Makuts [7] develops individual psychological profiles for tennis players, which determine the content and choice of means of psychological preparation. The authors also analyze the problems of injuries and diseases of the

musculoskeletal system of tennis players, suggest means and methods for preventing injuries in sports [3]. Scientists emphasize the importance of planning the preparation of high-class tennis players for the main competitions of the season [9]. Some authors define the features of the construction of the training process of young tennis players 5-6 years old, in particular, the specifics of the use of pedagogical control to assess the level of development of children's coordination abilities [10]. Researches of many specialists [12-14] prove the need to create optimal programs of the training process for the development and improvement of the athletic fitness of young athletes. When using such a system, it is necessary to remember that the creation of programs must be closely interconnected with all the components of a whole, that is, the development of physical fitness is determined by the interrelation of all qualities. Many scientists [1, 2, 5] identified the main approaches to the technical and tactical training of tennis players of different ages 5-6 years, 10-12 years, 14-15 years. However, the number of studies aimed at the development and improvement of the physical qualities of young tennis players is limited.

**The purpose** of our research was to develop and experimentally substantiate the method for developing the physical qualities of tennis players aged 12–13 years using React Balls and stretching.

## Material and methods

### *Participants*

The experiment was attended by 28 tennis players 12-13 years old sport school № 3 Severodonetsk, who were divided into control and experimental group of 14 people. Athletes of both groups did not significantly differ in most indicators of technical and physical readiness.

### *Organization of research*

The research was conducted within 8 months from August 2018 to March 2019. In the control group, standard exercises were used to develop flexibility. Such as: springy bends forward and to the side (standing, sitting); standing at the gymnastic wall; swing legs forward, backward; exercise with a partner (sitting, leaning forward with a partner's hands on the shoulder blades); exercises with the burdening of your own body (from hanging on the rear bar - sagging); exercises using your own strength (sitting, leaning forward with pulling the body to the legs with the hands on the feet). For the development of coordination and speed qualities in the control group, a set of exercises developed for the



experimental group was used, tennis balls were used instead of React Balls.

For athletes of the experimental group, a method of developing physical qualities was developed and implemented using exercises with React Balls and stretching. Stretch exercises were used in the preparatory and main parts of each training session of tennis players. Exercises with React Balls were used in the main part of each training session.

Stretch exercises were performed from a position of standing and sitting in static and dynamic modes. Mobility exercises in the elbow joints, stretching of the radial flexor of the wrist, and triceps muscles were performed as 2 sets of 10 s each. Stretching exercises for the muscles of the legs and ankles, including the muscles of the lower leg, ankle joints, peroneal muscle, and plantar fascia, were performed in 2-3 sets of 10 s each. The complex of exercises for the back muscles included lower lumbar rotation, stretching the muscles of the lower back, stretching with rotation, stretching with lateral tilts of 2-3 sets of 10-15 s each). Rest between approaches 10-30 s, the nature of the rest - complete relaxation. The number of exercises in one complex is from 4 to 10. The total duration of the entire load is from 10 to 15 minutes.

Also used were exercise React Balls, which consist of 100% rubber, diameter: 6.6 cm. It works on any solid surfaces, including wood shavings, rubber coatings, walls and soil. The six sides of this ball rebound in an unpredictable direction. Sample exercises:

1. Dribbling, as in basketball, changing the receiving hand.
2. Throws the ball into the wall at different angles and at different points. Catching the ball with one hand, then the other hand.
3. In pairs: standing facing each other, the partner throws the ball to the right or left. It is necessary to catch the ball after one rebound from the court (the distance must vary from 3 to 6 m).
4. In pairs: standing with your back to the partner, the partner throws the ball to the right or left. It is necessary to turn on the signal and catch the ball after one rebound from the court (the distance must vary from 3 to 6 m).
5. In pairs: standing facing the wall, back to the partner, the partner throws the ball into the wall. It is necessary to catch the ball after a rebound from the wall (the distance must be varied from 3 to 6 m).

6. In pairs: a partner throwing balls at different speeds to a player at the net or back line (the distance must be varied from 3 to 6 m).

Before and after the experiment, the physical fitness of tennis players from the control and experimental groups was tested.

*Methods.* To determine the level of development of speed, the following tests were used: Running 6 m (s); running 30 m (s).

To determine the level of development of coordination, the following tests were used:

Shuttle run 6 x 8 m was performed with a stop and touching the line. The execution time was fixed (s).

Jumps with skipping-rope, (number of times). Recorded the number of jumps in 1 minute.

To determine the level of development of strength and speed-power qualities, the following tests were used:

Throwing ball 1 kg, (sm), throwing was carried out in a movement similar to the feed. The best result was recorded after three attempts.

Push-ups 30 s (number of times).

Long jump from the spot (sm).

To determine the level of development of flexibility, the following tests were used:

Torso inclination forward from a sitting position (sm). Testing was carried out sitting on the floor, the test result was a mark on the perpendicular marking in centimeters, in which athletes reached out with the tips of their fingers in the best of three attempts.

Circular rotations in the shoulder joint with a gymnastic stick (number of times), the athlete takes the ends of the gymnastic stick, performs straight arm twists back. The number of revolutions recorded.

#### *Statistical analysis*

Digital material was processed using traditional methods of mathematical statistics using Microsoft Excel, SPSS. For each indicator, the arithmetic mean value, the standard deviation  $\sigma$  (standard deviation), the assessment of the significance of differences between the parameters of the initial and final results by the Student's t-test with the corresponding significance level (p)

#### **Results**

As a result of the experiment in the control group, the indicators of 3 tests significantly improved: «running 6 m, s», «shuttle run 6x8 m, s», «throwing ball 1 kg, sm», ( $p < 0,05$ ;  $p < 0,01$ ) (table 1)



Table 1

Indicators of physical fitness testing of tennis players of the control group before and after the experiment (n = 14)

Name of metrics	Group	Statistical Indicators				
		$\bar{x}$	S	m	t	p
Running 6 m, s	K <sub>1</sub>	1,58	0,14	0,04	2,03	<0,05
	K <sub>2</sub>	1,48	0,12	0,03		
Running 30 m, s	K <sub>1</sub>	4,98	0,09	0,03	1,58	>0,05
	K <sub>2</sub>	4,93	0,07	0,02		
Push-ups 30 s, number of times	K <sub>1</sub>	18,57	2,38	0,63	-0,66	>0,05
	K <sub>2</sub>	19,14	2,14	0,57		
Jumps with skipping-rope, number of times	K <sub>1</sub>	118,14	4,13	1,37	1,75	>0,05
	K <sub>2</sub>	120,43	2,59	0,69		
Shuttle run 6x8 m, s	K <sub>1</sub>	13,97	0,11	0,03	4,21	<0,01
	K <sub>2</sub>	13,75	0,16	0,04		
Throwing ball 1 kg, sm	K <sub>1</sub>	945,50	8,86	2,37	3,77	<0,01
	K <sub>2</sub>	956,86	6,96	1,86		
Circular rotations in the shoulder joint with a gymnastic stick, number of times	K <sub>1</sub>	3,51	0,89	0,24	1,53	>0,05
	K <sub>2</sub>	4,86	1,23	0,33		
Torso inclination forward from a sitting position, sm	K <sub>1</sub>	10,36	2,27	0,61	-1,84	>0,05
	K <sub>2</sub>	11,59	1,03	0,28		
Long jump from the spot, sm	K <sub>1</sub>	194,93	2,40	0,64	-1,32	>0,05
	K <sub>2</sub>	196,64	3,32	0,89		

Note: \* K<sub>1</sub> – control group before the experiment; K<sub>2</sub> – control group after the experiment

In the experimental group, the indices of 6 tests significantly improved: «running 6 m, s», «running 30 m, s», «jumps with skipping-rope, number of times», «shuttle run 6x8 m, s», «throwing ball 1 kg, sm», «circular rotations in the shoulder joint with a gymnastic stick, number of times», «torso inclination forward from a sitting position, sm» (p <0,05; p <0,01) (table 2).

Table 2

Indicators of physical fitness testing of tennis players of the experimental group before and after the experiment (n = 14)

Name of metrics	Group	Statistical Indicators				
		$\bar{x}$	S	m	t	p
Running 6 m, s	E <sub>1</sub>	1,56	0,13	0,03	3,99	<0,05
	E <sub>2</sub>	1,42	0,05	0,01		
Running 30 m, s	E <sub>1</sub>	4,96	0,11	0,03	2,45	<0,05
	E <sub>2</sub>	4,85	0,12	0,03		
Push-ups 30 s, number of times	E <sub>1</sub>	19,35	1,90	0,50	-0,33	>0,05
	E <sub>2</sub>	19,57	1,45	0,38		
Jumps with skipping-rope, number of times	E <sub>1</sub>	117,43	2,47	0,66	-2,20	<0,05
	E <sub>2</sub>	120,57	2,41	0,64		
Shuttle run 6x8 m, s	E <sub>1</sub>	13,88	0,24	0,07	3,47	<0,01
	E <sub>2</sub>	13,51	0,31	0,08		
Throwing ball 1 kg, sm	E <sub>1</sub>	945,71	6,80	1,82	0,54	>0,05
	E <sub>2</sub>	947,07	6,38	1,70		
Circular rotations in the shoulder joint with a gymnastic stick, number of times	E <sub>1</sub>	3,36	0,63	0,17	3,34	<0,01
	E <sub>2</sub>	6,21	0,70	0,19		
Torso inclination forward from a sitting position, sm	E <sub>1</sub>	10,64	1,69	0,45	-3,20	<0,05
	E <sub>2</sub>	12,86	1,96	0,52		
Long jump from the spot, sm	E <sub>1</sub>	193,71	2,73	0,73	1,36	>0,05
	E <sub>2</sub>	194,93	1,94	0,52		

Note: \* E<sub>1</sub> – experimental group before experiment; E<sub>2</sub> – experimental group after the experiment





After the experiment, significant differences between the control and experimental groups were identified. According to the test results «running 30 m, s», «circular rotations in the shoulder joint with a gymnastic stick, number of times», «torso inclination forward from a sitting position, sm» in the

experimental group, these figures are significantly higher compared with athletes in the control group; based on test results «throwing ball 1 kg, sm» control group is significantly higher than experimental ( $p < 0,05$ ,  $p < 0,01$ ) (table 3).

Table 3

Indicators of physical fitness testing of tennis control (n = 14) and experimental (n = 14) group after the experiment

Name of metrics	Group	Statistical Indicators				
		$\bar{x}$	S	m	t	p
Running 6 m, s	K*	1,48	0,12	0,03	1,90	>0,05
	E	1,42	0,05	0,01		
Running 30 m, s	K	4,93	0,07	0,02	2,15	<0,05
	E	4,85	0,12	0,03		
Push-ups 30 s, number of times	K	19,14	2,14	0,57	0,61	>0,05
	E	19,57	1,45	0,39		
Jumps with skipping-rope, number of times	K	120,43	2,59	0,63	-0,14	>0,05
	E	120,57	2,41	0,64		
Shuttle run 6x8 m, s	K	13,75	0,16	0,04	-1,04	>0,05
	E	13,51	0,31	0,08		
Throwing ball 1 kg, sm	K	956,86	6,96	1,86	3,87	<0,05
	E	947,07	6,38	1,70		
Circular rotations in the shoulder joint with a gymnastic stick, number of times	K	4,86	1,23	0,33	2,18	<0,05
	E	6,21	0,70	0,19		
Torso inclination forward from a sitting position, sm	K	11,29	2,20	0,59	2,03	<0,05
	E	12,86	1,96	0,52		
Long jump from the spot, sm	K	196,64	3,32	0,89	1,66	>0,05
	E	194,93	1,94	0,52		

Note: K – control group; E – experimental group

## Discussion

In the research, it was hypothesized that the use of stretching and exercising with React Balls in the training process of tennis players 12-13 years old, will increase their level of physical qualities. This hypothesis was fully confirmed. The results of the study are consistent with the opinion of many authors that the level of physical fitness of tennis players is one of the leading factors that ensures the steady progress of sportsmanship [12, 14, 15]. In the age period from 7 to 17 years, a solid foundation is laid for important motor skills and habits, the development of motor skills and the maturation of the main functions of the athlete's body are under development [1]. Therefore, at each stage of growing up, the trainer is obliged to pay special attention to the development of each physical quality. At the same time, it is necessary to develop individual qualities in mutual connection with other qualities, but in no case isolated from each other. Modern coaches are constantly looking for new ways associated with the preparation of young athletes. In the course of the training process, the role of the

coach is in the proper selection and use of all means and methods for developing the physical qualities of an athlete [12-14].

In this research, for young tennis players, stretch exercises and exercises with React Balls for the development of the reaction were selected. The combination of exercises for the development of flexibility, coordination and speed of reaction contributes to the formation of an optimal technique for performing motor actions of tennis players. The flexibility of a tennis player is manifested in the performance of basic techniques, especially such as serving, a blow above head. A tennis player with greater mobility in the joints has a better chance of hitting the ball, which is at a considerable distance from it (all other things being equal) [16]. Coordination qualities in tennis are especially pronounced when mastering the technique of strikes with different strength, direction, ball rotation, in other words - in the process of mastering the whole variety of technical actions of tennis players in a difficult game situation. It is very important to be able to quickly rebuild the motor activity also because it is often necessary to play on courts with



different surfaces. Different coatings are big differences in the speed of the ball and in the degree of its rotation. How quickly an athlete adapts to the rebound will largely depend on his success in the match. In addition, tennis players play tournaments either indoors or in the open air. Meteorological conditions, especially wind, place great demands on the coordination abilities of tennis players. Windy weather affects the game of both rivals, but the one who can, having understood his actions, can rebuild even a stronger opponent, can rebuild them according to the changed situation. The speed of a tennis player manifests itself during the movements he makes at maximum speed, if necessary, to get, for example, a shortened ball or a ball sent to the side. And how quickly the player starts moving in the direction of the ball, how quickly he picks up the desired speed, the success of the point draw depends in many respects.

Currently, among sports professionals it is extremely popular to use stretching as a form of preparing the muscular-ligamentous apparatus for training and competitive loads as a form of active rest for recovery [17-18]. The results of this study supplemented the data on the use of stretching in the training process of tennis players. So, scientists Aftimichuk et. al. [19] use stretching to prevent injuries, to prepare the body for stress and to correct the state of fatigue of tennis players. The authors emphasize that the physiological essence of stretching is that by stretching the muscles and holding a certain posture in them, the processes of blood circulation and metabolism are activated. They use the stretch exercises in the preparatory and final parts of the training session to warm up the muscles and hitch after physical exertion. In this study, stretch exercises were used in the main part of the training as the main means for developing flexibility. Stretching contributes to the development of the flexibility of the cervical, dorsal, lumbar, gastrocnemius and other muscle groups, joints, ligaments and tendons - almost without leaving any of them involved. In turn, in tennis, each movement has its own amplitude, and the larger this amplitude is, the more free movement, the stronger and more accurate the impact. Therefore, the use of stretching allows the tennis player's movements to be as wide and free as possible, contributes to the economy of movements, is an important condition for the development of other physical qualities [20-21].

Also, coaches in various sports often use exercise complexes with tennis balls. Such exercises develop coordination, speed and speed of reaction, help to respond quickly to an irritant at short distances. In this study, React Balls were used, which require extreme concentration of vision and speed of

reaction. The six-sided design of the ball allows you to suddenly change its direction of flight and rebound, the hexagon design causes the ball to jump and randomly bounce. When performing an exercise, the athlete is forced to move at different speeds in an unpredictable direction.

As the analysis of the results showed, at the end of the experiment, the indicators of flexibility, speed, and coordination improved significantly in the experimental group. This can be explained by the fact that stretching exercises contribute to the development of greater amplitude of movements, as well as form motor freedom, which affects the development of coordination. Only with sufficient flexibility can one achieve the necessary level of development of the physical qualities required by a tennis player. Improving speed, associated with repeated exercises with React Balls. The tennis player must see the ball, evaluate the direction of flight and the strength of the ball bounce, and then perform high-speed movements. In the control group, exercise complexes with tennis balls were used, which increased the level of speed and coordination abilities of athletes.

Thus, the positive results obtained in the course of work allow us to recommend the developed methodology for the development of physical qualities in the process of training tennis players in accordance with the tasks set.

## Conclusions

A method of developing the physical qualities of young tennis players, using React Balls and stretching, was developed and introduced into the training process. The use of this technique can significantly improve the performance of flexibility, speed, coordination of tennis players 12-13 years.

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## Conflict of interest

The authors declare that there is no conflict of interest.



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