

# Development of special flexibility in volleyball players

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## Abstract

**Objective of the study** was to determine the means and methods for developing the special flexibility of volleyball players, methods for assessing it and influencing the effectiveness of the performance of a technical element: receiving the ball with two hands from below after a serve or an attacking blow from an opponent.

**Methods and structure of the study.** In the course of the pedagogical experiment, the experimental group (EG) trained using the developed methodological tools that develop the special flexibility of volleyball players, including a set of special exercises and tools for its assessment. Methodological influences were carried out for 30 minutes during each training session. The control group (CG) was engaged in the program for the Children's and Youth Sports School. The experiment involved 62 pupils of the Sports School of the Olympic Reserve of the city of Angarsk, aged 11-14 years. The experiment lasted from September 2019 to September 2021.

**Results and conclusions.** In the course of the study, it was found that in the CG there were no significant changes in the values of indicators characterizing the special flexibility and mobility of the joints that affect the effectiveness of the performance of game techniques, and in the EG their significant improvement was observed. In the process of conducting special testing, the results of performing a ball reception from below and the values of indicators characterizing the level of development of the SG were evaluated and compared.

As a result of the study, a methodology for the development of special flexibility was developed, which includes a set of special exercises that develop this quality, as well as methods for assessing the values of special flexibility and the effectiveness of performing the technique from below, as a game technique that allows assessing the width of the amplitude of movement of the lower limbs and the spinal column.

**Keywords:** special flexibility, volleyball, developmental technique, bottom hold.

**Introduction.** With all the variety of game techniques and situations that arise in the course of competitive activity in volleyball, the main quality of players that determines the effectiveness of their game activity is the ability to accurately select and take the optimal position to receive the ball after the opponent's serve or attack in a defensive action [1].

At the same time, the successful application of the technical element "reception" depends on psychomotor reactions and high mobility of the ankle, knee, hip joints and spinal column [4].

Special flexibility is understood as a characteristic that allows performing technical elements and tech-

niques with maximum amplitude [3]. Unfortunately, scientific sources do not pay enough attention to the development of special flexibility in volleyball. However, the mobility and flexibility of the limbs and spine of volleyball players not only affect the quality and accuracy of getting under the trajectory of the ball, but also to exclude possible injuries and reduce the recovery time after them [2].

All this suggests that the use of special flexibility development methods in volleyball can significantly increase game performance, provide an opportunity for more virtuosic performance of complex techniques, reduce the level of injuries among players and shorten the period of their post-traumatic recovery [5].



**Objective of the study** was to determine the means and methods for developing the special flexibility of volleyball players, methods for assessing it and influencing the effectiveness of the performance of a technical element: receiving the ball with two hands from below after a serve or an attacking blow from an opponent.

**Methods and structure of the study.** In order to test the effectiveness of the developed methodology, a pedagogical experiment was organized and conducted, which included an assessment of the level of development of special and general flexibility, as well as the performance by athletes of receiving the ball with two hands from below.

Determining the effectiveness of receiving the ball with two hands from below was carried out using tests for target accuracy:

- After his own impact on the floor, hitting the ball cart.
- After one's own throw into the basketball backboard, hitting the basketball basket after the rebound.
- After attacking from the partner's bollard through the net, hitting the ball cart.

Testing was carried out for three days, in each of which the participant performed six attempts. Hits in the first attempt were estimated at 2 points, in the rest - at 1 point. For the assessment, the sum of points scored by the subjects within three days was used.

The experiment was conducted with pupils of Angarsk sports schools from September 2019 to September 2021. The CG included 32 boys aged 11-14 years of the volleyball department of the Olympic Reserve Sports School "Ermak", and the EG - 30 boys of the Olympic Reserve Sports School "Angara" of the same age. Athletes took part in the pedagogical experiment

of their own free will and in agreement with their parents.

Athletes from the CG and the EG were tested for the significance of differences in the values of indicators characterizing the mobility of their hip, knee, ankle joints and spine flexibility.

Reception from below in volleyball is most often used to reflect the power supply or attack of the opponent. A high-quality reception from below ensures the transition of the team from defense to attack. A high level of technical readiness, as well as speed and coordination abilities, cannot fully ensure the accuracy of entering the trajectory of a flying ball and taking the right position for its accurate reception from below. The pass from below with two hands is performed at a low position of the body with legs wider than shoulders, which reduces the time to reach the desired point and provides more variable and flexible rotation of the forearms forming the platform. The movement of the legs on toes in a deep squat puts a load on the joints: ankle, knee, hip, and also the spine. The maximum possible amplitude of their mobility and flexibility provides the opportunity for the most effective exit under the angle of attack and accurate reception.

The athletes from the CG trained in the usual mode, provided for by the training program of the Sports School of the Olympic Reserve, and the EG athletes trained using the developed developmental methodology, which includes a set of special developmental exercises (Table 1) and methods for assessing flexibility (Table 2).

The assessment of the significance of differences in the results of performing a technical game technique was carried out using the nonparametric Mann-Whitney test (Table 3).

**Table 1.** *Developmental exercises*

No.	Exercises	Description
1.1.	Static	Stretching is a system of static exercises aimed at developing flexibility. The physiological essence of stretching is to stretch the muscles and hold them in a certain position under a static load, while activating the processes of blood circulation and metabolism.
1.2.	Ballistic	Slow stretching and holding in the final stationary state with the maximum possible range of motion.
1.3.	Proprioceptive	Fast sharp contractions in the extreme phase of the available range of motion of the joints, produced by antagonist muscles in relation to those muscles that provide extension of the joint
1.4.	Plyometric	The plyometric method of training is aimed at developing explosive strength, but when using it, an increase in the amplitude of joint mobility is achieved. It provides for the performance of vertical jumps, jumps to the surface of various heights, jumps from the surface, side jumps, long jumps, jumps with a turn and mixed jumps with landing on one leg, on two with a pause before continuing or a short static load, etc. Mixed static loads with ballistic ones are applied - static-dynamic.
1.5.	Neuromuscular	The unconscious response of a muscle to a signal regarding the dynamic stability of a joint. The neuromuscular training program addresses several aspects of sensorimotor function and functional stabilization and is based on biomechanical and neuromuscular properties that improve sensorimotor control and compensatory stability. Unlike conventional dynamic loads, neuromuscular exercises are aimed at improving the quality of movements and focus on the psychomotor control of joint movement in all biomechanical planes.

**Table 2.** *Methods for assessing general and special flexibility*

No.	Methods for assessing special flexibility	Description
2.1.	Measurement of the overall flexibility of the spinal column and lower limbs	Tilt forward with arms stretched down in a standing position on the pedestal, performed similarly to the GTO test. Measured in cm below zero
2.2.	Measurement of mobility in the knee joints	The subject performs a squat with arms extended forward or behind the head. Full (deep) squatting indicates high mobility in these joints. The distance is measured from the depth of the hips to the floor surface in cm, the feet are parallel to the width of the shoulders
2.3.	Measurement of mobility in the ankle joints	The measurement was taken in the supine position. In this case, the following parameters were measured:  - the angle of deviation of the ankle from itself (optimal result - 0°).  - angle of inclination of the ankle on itself (worst result -90°)
2.4.	Measuring the mobility of the hip joint	Estimated planting depth on transverse twine in mm (best result is 0 mm)
2.5.	Stabilometry	Assessment of mobility of the lower extremities. The athlete stands on one leg, the other leg is raised and bent at the knee joint. Arms crossed over chest, eyes closed. The task is to stand for at least 1 minute. The athlete is given three attempts with a change of legs

The technology of sports training of the 4th and 5th years of study is 48 hours per month. The total time allocated for solving the problems provided for by the developed methodology for the development of special flexibility included 30 minutes at each training session and for two years amounted to 288 hours.

In the complex, the methodology for developing special flexibility included: tests for measuring special flexibility, assessing the quality of receiving the ball with two hands from below, a set of special exercises aimed at developing the special flexibility of volleyball players.

**Results of the study and their discussion.** At the beginning of the experiment, there were no differences in the results of evaluating tests for special flexibility between athletes from the CG and the EG. At the end of the experiment, there were statistically

significant differences between the CG and the EG in the results of all five tests. The average increase in values characterizing the level of development of special flexibility relative to own initial results at the end of the experiment in the EG was 33%, and in the CG - 7.7%.

The results of the tests for technique and target accuracy showed that at the beginning of the experiment, the hit rate for most athletes was less than 50% and there were no significant differences between athletes from the CG and the EG. At the end of the experiment in the CG and the EG, the percentage of the control exercise for accuracy increased significantly; in the EG, at the end of the experiment, several players had 100% hits in all attempts. In the CG, at the end of the experiment, the best result of hitting 60% was recorded.

At the end of the experiment, statistically signifi-

**Table 3.** *The results of assessing the performance of the reception from below with two hands*

No.	Control group		Experimental group		Significance of differences between EG and CG
	Start Me (25; 75)	End Me (25; 75)	Start Me (25; 75)	End Me (25; 75)	
3.1.	5 (4,5; 6)	6 (5; 7)	5 (4,5; 7)	12 (8,5; 15)	$P_{нач.} > 0,05$ $P_{кон.} < 0,01$
	p<0,01		p<0,01		
3.2.	7 (5,5; 9)	9 (7; 11)	6 (5; 8)	15,5 (13,5; 18)	$P_{нач.} >> 0,05$ $P_{кон.} < 0,01$
	p<0,01		p<0,01		
3.3.	6 (5; 8)	8 (6; 9)	6 (5; 8,5)	14 (13; 16)	$P_{нач.} >> 0,05$ $P_{кон.} < 0,01$
	p<0,01		p<0,01		



cant differences were observed between the test results obtained in the CG and the EG, which indicates the effectiveness of the developed methodology for developing special flexibility in the training process of volleyball players. At the same time, the influence of the level of special flexibility on the effectiveness of the performance of receiving the ball with two hands from below was proved experimentally.

**Conclusions.** The application of the methodology for the development of special flexibility of volleyball players in the training process made it possible to statistically significantly improve the values of indicators characterizing this physical quality among athletes, which ultimately provided a significant increase in the effectiveness of the performance of receiving the ball with two hands from below after the opponent's serve or attack.

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