

Development of Special Stamina for Highly Qualified Volleyball Players in the Annual Cycle

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Abstract: Currently, volleyball has achieved such a degree of development that the preparation of athletes is at a very high level. Hence, the outcome of sports games is largely determined by the success of actions in difficult game situations due to the manifestation of the endurance of athletes. More significant competitions determine higher standards for the physical condition of the athletes. Achieving high indicators of special endurance to ensuring the functioning of all body systems when performing specific loads of a volleyball match provides significant assistance in formation confidence in achieving the set results. A high level of special physical fitness contributes to the winning of long ball games, to perform attacking and blocking actions at the maximum jumping height of volleyball players and other manifestations of special endurance.

1. Introduction

During the volleyball match, the player makes many jumps to block and attack strikes, falls to receive the ball in defense, repeated movements at high speeds, with sudden stops and a change of direction. The performance of these actions requires athletes to put maximum physical efforts during the whole playing period of time. The manifestation of the main physical qualities is required, one of which is personal endurance [1]. Endurance helps players to successfully cope with prolonged work in training sessions and competitions, to recover more quickly after the load. Diagnostics of physical preparation allow us to judge the functional capabilities of the athlete, and therefore, to set before it realizable tasks for him [2].

However, in the scientific and methodical literature, there was a problem situation containing contradictions in the modern theory and practice of volleyball. These contradictions consist in sufficient development of methods of development of general endurance of athletes, and insufficient disclosure of possibilities of formation of special endurance of volleyball players.

2. Materials and Methods

In recent years, there has been a tendency to consider the equal anaerobic capacity of the body and special endurance, and even with the possibility of achieving a certain sporting result. One cannot but agree with the opinion of the authors of [3], who say that working capacity, special or general endurance (especially a sporting result) depend mainly on the strength of mental processes, the preparedness of the musculoskeletal system. In other words, it depends on the efficiency with which the energy generated in the body as a result of aerobic and anaerobic processes is used.

To obtain an objective assessment of the development of endurance in volleyball players, we applied the following tests:

1. Test for determining special (hopping) endurance.

The subject performed a series of jumps to the optimal height. A stuffed ball weighing 3 kg is put into the net, a rope of 7-8 m in length is tied to its upper edge. The free end of the rope is thrown over the basketball backboard and secured.

The player, standing under a ball suspended at the optimum height (which can be changed using the free end of the rope), tries to perform the maximum possible number of jumps from a place, taking the ball with both hands. The height at which the ball is placed is determined by adding 60 cm to the height of the player. The player is not allowed to pause between individual jumps and any run. The player is counted only those jumps in which he managed to touch the ball. As soon as the subject performs three jumps without touching the ball, the test ends.

2. Striking from Zone 4 of the volleyball court for 2 min 30 s, with an intensity of 12-14 attacking beats per minute (running the attacking player from the 3-meter line). Checking the recovery heart rate after load up to the value of 120-130 bpm/min.

Assessment: Heart Rate Recovery. The performance scale:

- For 45-90 sec. – high;
- For 90-120 sec. – good;
- For 120-160 sec. – satisfactory.

3. The complex test of a volleyball player. From Zone 1, the ball is served in the jump, then the player moves and performs an attack strikes from the back zone, after which he/she imitates blocking in Zones 2, 3, and 4, after which he/she drops and moves to complete the serve from Zone 5. Further, the test subject repeats the same task from another zone (only two times from each zone). The task is to complete all technical elements without errors, in a strictly specified sequence.

Assessment:

- Up to 60 sec. – excellent;
- From 66 to 70 sec. – good;
- More than 70 sec. – satisfactorily.

The results obtained made it possible to judge the initial and final indicators of the manifestation of endurance and physical fitness of the subjects.

3. Results

The literature review conducted by us indicates the potential for the development of special endurance through the use of directed means of pedagogical influence. In particular, it is possible to achieve significant results by using special exercises with the ball, using the method of repeated-variable training, with a gradually increasing volume of training loads. Kindly note that the method of repeated-variable training is characterized by a systematic change in the speed of the exercise in the direction of increase so that there is oxygen debt (short-term), which should be repaid with the further exercise at a moderate pace or in arbitrary pauses for rest. Before increasing the intensity, the exercise must be performed at a pulse of 140-160 bpm/min, after increasing the intensity – 180 bpm/min.

To increase the level of special endurance, physical exercises introduced into the developed complexes for the development of general and special endurance were used as pedagogical means.

Complex for developing general endurance:

1. Uniform running at a distance of 500 m, intensity – 40% of the maximum. Resting interval – 10 min. The number of repetitions – 2 times. The nature of rest–active loads: jogging, exercises to restore breathing.
2. Running at an average pace, alternating with walking.
3. Swimming in the pool – 1-1.5 km.
4. Cross-country running – 3-5 km. After each overcomes one kilometer – 100-150 m.
5. Running at 300 m.

6. Acceleration in the zones of the volleyball court (on one side) with the return to Zone 1. Execution: the number of repeats – 3 series of 1 min. Rest between repeats – 1 min.
7. As homework, volleyball players were recommended to perform loads, in the form of a 1000 m. run at a moderate pace.

General endurance involves the development of physical qualities, strengthening the musculoskeletal system, improving moral and volitional training, and creating the necessary base of aerobic capabilities. In turn, aerobic capabilities contribute to the development of the special endurance of volleyball players.

Special endurance is developed by exercises aimed at improving the technique, in combination with a series of exercises that require great physical loads or exercises of high intensity.

The complex of exercises, for the development of special endurance:

1. Top ball transfers in pairs after moving in different directions and at different speeds:
 - a) Movements in the low defender stance in various directions; execution – 1.5 min, 3 series| rest – 30-45 sec.;
 - b) In pairs: throwing the ball in different directions from the player. The player performs the top transfer of the ball after movement. Execution: throwing the ball on a high trajectory, gradually reducing it. Duration – 20-30 sec. Intensity – maximum. The number of repeats – 7-10 in the lesson.
2. Transferring the ball from the top and bottom in pairs with a drop after moving, execution: the number of falls – 5-10 times. Intensity – maximum. The number of repeats – 3 series.
3. Imitation block. Execution: number – 15 jumps. Intensity – maximum. The number of repeats – 5-6 series. Rest between repeats – 2 min.
4. Imitation of blocking after moving, execution, the number of repeats – 6-8 series. The duration of one repeat – 15 sec. Intensity – maximum. Rest – 2 min.
5. Homework: Transferring the ball from the wall while the volleyball player is moving, 20 min. The percentage distribution of the complex of pedagogical influences is presented in Fig. 1.

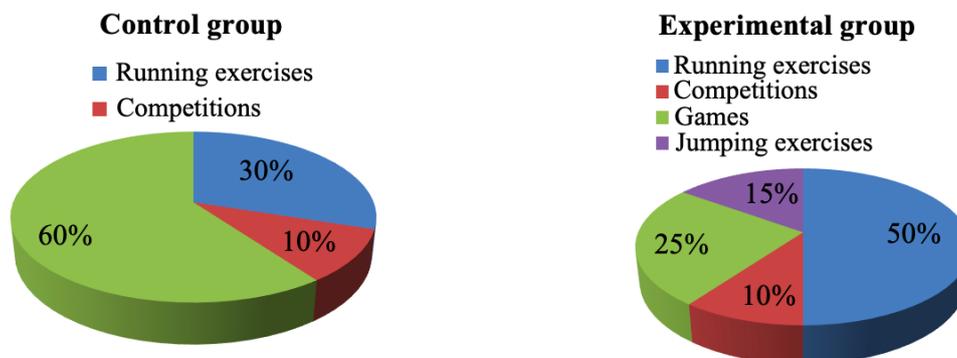


Fig. 1. The percentage distribution of training effects used in the experimental and control groups.

In the experimental group, three classes of 40 minutes each, in a weekly microcycle, were devoted to the development of special endurance, one to the formation of general endurance.

At the first stage, for the development of general endurance, a uniform method of performing exercises was used, then, the exercises of repeatedly variable nature and an interval method were performed.

In the first stages, the intensity of work on training reached 40% of the maximum. Then, the intensity gradually increased and reached 60%. At the beginning of this period, the game time was greater than that provided by the rules of the game (of the two parts, active rest was 10 min.). Then, as the intensity increased, the game time decreased or one period was spent, but longer than usual.

During resting time, students performed active exercises to develop flexibility, walking with tasks, free throws of the ball on the ring, goal, two-handed passes on top of the ball in pairs.

4. Discussion

An analysis of the research results shows that volleyball players are characterized by a relatively low level of development of both aerobic and anaerobic abilities. Hence, volleyball players lack the development of speed endurance and speed-strength training, which is probably the result of the training system used (Table 1). As a result of the experiment, data were obtained that indicate the formation of special endurance among qualified volleyball players.

TABLE 1. INDICATORS OF SPECIAL ENDURANCE OF VOLLEYBALL PLAYERS BEFORE THE EXPERIMENT

Tests	Experimental group	Control group	p
Desired endurance (amount)	12 ± 1.5	12.4 ± 1.5	>0.05
Recovery time after attacking strikes (sec.)	122.9 ± 10.8	116.2 ± 11.4	<0.05
Complex testing for a volleyball player (c)	74.3 ± 6.3	72.7 ± 4.2	<0.05

Based on the analysis of the test results before the experiment, we found that the jump endurance in the experimental group was 0.4 times less than in the control group and equal to 12 ball touches in the group average, at $p > 0.05$. But in the other two tests, the indicators of the control group exceed the results of the experimental group. So, in the test for recovery after performing attacking strikes for 2 min. and 30 sec., the result of the control group was 116.2 ± 11.4 sec., and the experimental group showed the result of 122.9 ± 10.8 sec. In the complex test of a volleyball player, the superiority of the control group was 1.6 sec., which amounted to 72.7 ± 4.2 sec., In the experimental group 74.3 ± 6.3 sec., while the results were reliable and amounted to $p < 0.05$.

Special endurance is developed by exercises aimed at improving the technique, in combination with a series of exercises that require great physical loads or simulation exercises of high intensity. This is confirmed by the work of M. Ya. Nabatnikova (1994), which, as the main means of developing special endurance for volleyball players, used special exercises with the ball, applied by the method of repeated-variable training with a gradual increase in the volume of training loads.

Based on the analysis of data on the development of endurance in volleyball players, we developed complexes of exercises and implemented them in the training process.

For the study, the subjects were divided into two equal groups (experimental and control) of 10 people.

Training sessions in the experimental group were conducted using the developed complexes of exercises. The control group was engaged in a generally accepted program for groups to improve sports skills.

Control testing was conducted twice, namely, both at the beginning (August 2018) and end (April 2019) of the study.

The development of the necessary physical qualities and abilities creates favorable conditions for mastering the technical and tactical actions in volleyball (Table 2).

TABLE 2. INDICATORS OF SPECIAL ENDURANCE OF VOLLEYBALL PLAYERS AFTER THE EXPERIMENT

Tests	Experimental group			p	Control group			p
	Before	4th month of the exp.	After		Before	4th month of the exp.	After	
Desired endurance (amount)	12 ± 1.5	15.0 ± 2.1	17.9 ± 2.4	<0.05	12.4 ± 1.5	13.1 ± 1.5	14 ± 1.5	<0.05
Recovery time after attacking strikes (sec.)	122.9 ± 10.8	109.4 ± 8.2	99.4 ± 9.4	<0.05	116.2 ± 11.4	114.8 ± 11.4	111.8 ± 10.4	<0.05
Complex testing for a volleyball player (c)	74.3 ± 6.3	70.7 ± 4.9	65.7 ± 5.3	<0.05	72.7 ± 4.2	71.0 ± 4.6	71.4 ± 4.2	<0.05

Based on a detailed analysis of the results of testing conducted after the experiment (Table 2), we found that the jump endurance in the experimental group increased by 5.9 times, and amounted to 17.9 ± 2.4, with an indicator of 14 ± 1.5 in the control group, with $p < 0.05$.

In the test for recovery after performing attacking strikes for 2 min. and 30 sec., the result of the control group was $111,8 \pm 10,4$ sec., and the experimental group took $99,4 \pm 9,4$ sec. In the volleyball complex test, the superiority in the experimental group was at 5.7 sec., 65.7 ± 5.3 sec., and 71.4 ± 4.2 in the control group. Moreover, the results obtained in all tests were $p < 0.05$.

This proves that the speed-power endurance of the subjects in both groups improved. The decrease or increase in the height of the jump corresponds to the deterioration or improvement of the special performance of the subject of his speed and strength endurance.

5. Conclusion

An analysis of the results showed that positive shifts occurred in all indicators in both groups. The level of special endurance has increased. However, in the experimental group, they were more significant than in the control group. This is because the use of running exercises gives a higher result than the use of elements of game sports (football, basketball, handball). In addition, one should note that currently, we do not yet have an effective system of endurance training volleyball players. At the same time, existing endurance training systems, established in other sports, make it possible to use various forms and methods of endurance development in volleyball. The main task is to adapt these forms of training to the specific conditions of volleyball.

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