

Study of special endurance of young volleyball players of different age groups and its impact on the effectiveness of the performance of certain game actions

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Abstract:

The development of modern sports increasingly requires a scientific approach to the training of athletes. An important place in the system of athletes' training is their physical training, searching for new and improving existing means and methods of developing physical qualities.

The purpose of the present study is to improve the methods of development and control of special endurance for young volleyball players of the age of 13-18.

In the article, the issues related to studying the special endurance of young volleyball players of different age groups and its impact on the effectiveness of particular game actions are considered.

As research methods, we used analysis and generalization of the data from scientific-methodological and specialized literature, pedagogical observation of training and competitive activities and analysis of work plans, and the methods of mathematical statistics.

The results of the research showed that the growth of skills of young volleyball players is largely connected with the increase in the level of special endurance. The special endurance of young volleyball players is characterized by a complex of major special physical qualities and functional capabilities that are necessary for performing technical and tactical actions in the process of training and competitions with high efficiency and economy. A complex assessment of special endurance consists of the indicators of jumping, speed and gaming endurance. The speed and strength qualities and jumping endurance of young volleyball players reliably increase from 13 to 16 years. In 17-18 years, these changes in young volleyball players are questionable.

Keywords: - special endurance, technical and tactical actions, competitive activity, athletes, physical training.

Introduction

Modern sport, including sports games, is characterized by high exertion during competitions and requires considerable physical training of athletes (Belyaev, 2002; Marques *et al.*, 2009).

In 2001, the International Volleyball Federation (FIVB) introduced significant changes and additions to the rules of the game in order to increase the audience appeal of the competitions. The new rules of the game encourage athletes to expand the range of technical and tactical actions and maintain a high intensity of competitive activity throughout the game. This puts significantly higher demands on the physical preparedness of volleyball players, since insufficient level of it will negatively affect both the mastery of technical and tactical skills and the effectiveness of competitive activity (Tillman *et al.*, 2004).

Thus, in the modern volleyball, the physical preparedness of athletes acquires a special significance in connection with the expansion of the range of their game actions (Rytsarev, 2009) and the increase in the intensity of the game, which requires athletes to exercise maximum physical effort in the situations that change rapidly on the volleyball court. The high level of achievements in modern sports not only necessitates the constant improvement of all aspects of athlete preparation in technical, tactical and physical dimensions, but also requires great moral and volitional qualities (Almeida & Soares, 2003).

The up-to-date scientific evidence indicates that the effectiveness of the training process of volleyball players can be achieved only when all types of training are taken into account (Movsesova, 2009). However, physical training is the basic one, so its composition needs to be formed taking into account the individual characteristics of the growing organism, mastering and using technical means of control in the learning-training process.

Despite considerable successes in the theory and methodology of volleyball, at the present time, not all possible reserves for training volleyball players of mass ranks have been exhausted. One of such reserves is the

improvement of the technique of technical and physical training of athletes (Sozen, 2012; Cosma *et al.*, 2014).

The most important in improving the quality of the learning-training process of young volleyball players is, in our opinion, the problem of improving their technical and physical training.

It is known that an important place in the general system of physical training, in particular, of young athletes, belongs to special endurance (Zheleznyak, 2006; Shgaepova, 2016). The development and control of special endurance of young athletes is one of the most topical problems of the theory and practice of sports. The analysis of the problem shows that science thoroughly considers the issues of special endurance, including that of young athletes. This problem is especially developed in cyclic sports (Shepilov, 2014; Shvetsov & Kudinov, 2015).

Despite the fact that the issue of development and control of special endurance plays an important role in improving the sport skills of young volleyball players, there are not enough studies related to solving this problem for young players. Therefore, it is important to study the level of development of special physical qualities, methods and means of their development and control, which play a decisive role in achieving high indicators of the competitive activity of young volleyball players.

Methods

The purpose of the research is to improve the methods of development and control of special endurance for young volleyball players of the age of 13-18.

The tasks of the research are:

1. To analyze modern systems of tests and criteria for assessing the level of special endurance of young volleyball players aged 13-18;
2. To analyze the structure of game activity;
3. To determine the age dynamics of the indices of special endurance for young volleyball players aged 13-18.

As research methods we used analysis and generalization of the data from scientific-methodological and specialized literature, pedagogical observation of training and competitive activities, analysis of work plans, and the methods of mathematical statistics.

Results

The analysis of game activity has shown that it consists of short-term alternation of active working phases with maximum intensity and relatively (passive) short-term rest pauses (see Table 1).

Table 1. Indicators of the structure of game activity for young volleyball players aged 13-18

No.	In one set	Aged 13-14	Aged 15-16	Aged 17-18
1	Active phase (s)	12.5 ± 1.2*	8.1 ± 0.9	7.9 ± 0.9***
2	Passive phase (s)	9.4 ± 1.5 *	7.0 ± 1.1	6.5 ± 1.3***
3	Number of jumps	12 ± 5.2*	20 ± 7.1**	25 ± 7.4***
4	Number of falls	7 ± 4.4	1.1 ± 5.2	16 ± 6.3***
5	Number of accelerations	19 ± 7.3*	2.8 ± 9.2**	32 ± 11.4***
6	Number of serves by one player	2.3 ± 1.0*	5.2 ± 2.5	6.8 ± 2.7***
7	Number of passes by one player	2.6 ± 1.1*	6.1 ± 2.3	7.4 ± 2.5***
8	Number of reception from below by one player	4.3 ± 2.0*	7.5 ± 2.4	8.2 ± 2.5***
9	Number of reception from above by one player	2.1 ± 1.1*	5.3 ± 3.2	6.4 ± 3.1***
10	Number of spikes by one player	3.7 ± 1.7*	6.5 ± 1.9	8.4 ± 2.4***
11	Number of blocks by one player	3.1 ± 1.5*	7.8 ± 2.2	8.0 ± 2.6***

Remark: * – the differences between 13-14-year-old and 15-16-year-old volleyball players are statistically significant for $p < 0.05$; ** – the differences between 15-16-year-old and 17-18-year-old volleyball players are statistically significant for $p < 0.05$; *** – the differences between 13-14-year-old and 17-18-year-old volleyball players are statistically significant for $p < 0.05$.

It has been established by observations that, for young volleyball players aged 13-14, the average active phase is 12.5 s, while from 13 to 18 years it decreases to 7.9 s, and the passive one is from 9.4 s to 6.5 s. During the game, depending on the number of sets played, the working phase is repeated 185-360 times. The average duration of individual periods of intense muscular activity amounts to 52.3 seconds.

A large number of jumps and accelerations is the main characteristic of motor competition activity for young volleyball players.

According to our observations, the average number of jumps in the set with the increase of age reaches a level of 25 ± 7.4 . The large value of the standard quadratic deviation indicates that different players are differently loaded with jumps during one set. The jumping load near the net depends on the specialization of the attacker. In the third zone, most jumps are performed for simulation or execution of a strike or block. In addition, it is important to note the tactic of choosing a spiker by a setter to complete the attack. Other studies also indicate

that the number of jumps in a set can fluctuate within a large range (from 11 to 25 jumps) (Kulikova & Danilova, 2016).

The number of technical and tactical actions during the competition also has some ranges of fluctuations depending on the age and intensity of the game. So, the number of serves per a set has a tendency to increase from 2.3 to 6.8 serves for the age of 13 to 18 years. The number of passes, attack strikes and blocks has the same direction of change. The number of techniques per a unit of game (point, or transfer of serve) depends on the balance of the skill levels of attack and defense during the competition.

The improvement of skills causes a decrease in the number of passive phases and an increase in the duration of the active phase in the competition between the opposing teams of young volleyball players. At the same time, the intensity and duration of active motor phases both for young volleyball players and adults is determined by the quality of the defensive actions and by the rules of the competition (three touches of the ball, etc.), which makes it impossible to often observe the long active phases of the game.

We observed long active phases of 10-16 seconds on average in young volleyball players of 13-14 years during the competitions; and, interestingly, such phases are repeated rather often during the game. This can be explained by the weak force of attacking actions in comparison with defensive actions.

It should be noted that in the structure of motor activity of young volleyball players, the number of falls is on average up to 10 during the game, because at this age they have little mastery of the technique of performing such defensive actions.

Using the results of the correlation analysis, we have found that at the age of 15-18 years the jumping endurance indicators are closely connected with the total number of game actions with or without the ball, both in attack and in defense ($r = 0.569$, $p < 0.05$).

The indicator of the number of game actions in our pedagogical observations was determined by the ratio between the corresponding indicators; for example, the ratio of the total number of blocks to the number of really necessary blocks required by game situations in a separated set or for the entire game. The closer this index is to 1.0, the higher is the endurance of a volleyball player.

According to the results of our research, it is established that the coefficients of game endurance for young volleyball players grow with age, that is, with age, the game endurance improves (see Table 2).

Table 2. Indicators of game endurance for young volleyball players aged 13-18

Technical and tactical actions in the process of competition by one player		Age groups		
		13-14 years	15-16 years	17-18 years
1.	Number of blocks performed by the player	7.1 ± 4.1	11.5 ± 4.4	13.2 ± 5.2
2.	Number of really needed blocks	11.2 ± 5.3	14.5 ± 4.2	15.7 ± 6.1
Coefficient of game endurance in performing a block		0.64 *	0.78 **	0.85 ***
1.	Number of block assists performed by the player	8.1 ± 3.3	10.4 ± 4.0	12.8 ± 4.2
2.	Number of really needed block assists	13.3 ± 4.2	13.5 ± 3.1	14.9 ± 3.4
Coefficient of game endurance in performing a block assist		0.61 *	0.76 **	0.85 ***

Remark: * – the differences between 13-14-year-old and 15-16-year-old volleyball players are statistically significant for $p < 0.05$; ** – the differences between 15-16-year-old and 17-18-year-old volleyball players are statistically significant for $p < 0.05$; *** – the differences between 13-14-year-old and 17-18-year-old volleyball players are statistically significant for $p < 0.05$.

The results of the research show that the indices of special (jumping) endurance influence the game activity, primarily because of the volume of motor game actions that are required by the very intensity and mental tension of the game. And this is understandable, because the effectiveness of specific technical and tactical actions of attack or defense is connected not only with the physical qualities, but also, first of all, with the level of technical and tactical preparedness of volleyball players. This is especially true when the level of physical preparedness of opposing players in the game situations of attack and defense is approximately the same.

Discussion

At the end of the study, the questionnaire method was used for coaches to identify the problems of improving the training process of the beginning volleyball players; the following results were obtained:

- The interviewed coaches turned out to be experienced specialists with work experience of 6 to 16 years, and one coach had 29 years of training experience;
- The majority of the respondents-trainers (44.7%) preferred a differential method of training, only some of them applied the circular and group ones;

- The processing of the answers to the questions of effectiveness of overloading in the training process gave the following: 100% of respondents agreed that overloading in training was effective. Also, 25% thought that overloading led to increase in the overall and special preparedness; 65% held the opinion that overloading helped in increasing the strength of the muscles of the upper limb girdle and lower limbs;
- All respondents agreed that overloading was expedient to apply at the age of 14-15 and 17-18 years, depending on the magnitude of the load;
- The respondents quite clearly expressed their opinion on improving the training process with the help of overloading. Part of the trainers (25%) claimed that, with the help of overloading, the load was increased on that muscle group which further fostered an increase in the level of physical fitness of volleyball players;
- 45% of respondents thought that, with the help of overloading, the intensity of training work increased;
- Each of the coaches, in his own way, expressed his opinion on improving the training process. The respondents saw the following ways of improving the efficiency of the training process in modern conditions: 35% thought that the mental approach and systematic character of the training sessions led to improvement in the training process; another 27% defended the principles of the systematic character, discipline of training sessions, the use of innovations and training simulators;
- The answers to the questions concerning the effectiveness of the circular method of training for the improvement of physical and technical preparedness were paradoxical. After processing the data, we found out the following: 23.7% of respondents assured that the circular method was effective only when improving physical fitness; the opposite opinion was expressed by 59.2% of respondents, arguing that it was this method of training that was effective in improving these types of training. This, in our opinion, pointed to a certain lack of complete information about the circular training on the part of the coaches.

Conclusions

The analysis of literature sources shows that the methods of development and control of special endurance in the training of young volleyball players of different age groups are not sufficiently developed, especially in the annual cycle of training.

The results of the research show that the growth of skills among young volleyball players is largely due to the increase in the level of special endurance. An effective system of control and development of special endurance plays an important role in this regard. Such a system for young volleyball players has only partially been developed; the specifics of its application in age groups of 13-18 years are not sufficiently defined and specified.

Special endurance of young volleyball players is characterized by a complex of major special physical qualities and functional capabilities that are necessary for performing technical and tactical actions in the process of training and competitions with high efficiency and economy. Complex assessment of special endurance consists of indicators of jumping, speed and game endurance.

The speed and strength qualities and jumping endurance of young volleyball players reliably increase from 13 to 16 years. In 17-18 years, the changes in these indicators in young volleyball players are questionable.

The development of special endurance should be carried out according to the following method: a set of exercises with weights on a circular system. The means of physical and technical training should be selected taking into account the age, individual and functional capabilities of the organism of each volleyball player, as well as the characteristics of volleyball as a sport.

The prospect of further research can be an assessment of the effectiveness of the proposed methodology for improving special endurance.

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