

Technical and tactical preparation of elite athletes in team sports (volleyball)

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Abstract

In modern volleyball, the success of competitive activity depends on many factors, the main of which, by definition of experts, is an athletes' technical and tactical preparation, which integrates key components of preparedness and directly affects the decision of problems of increasing efficiency of elite volleyball players' competitive activities. The characteristic feature of modern volleyball is the significant increase in the intensity variation of tactics, the universalization of players and their narrow specialization, which is caused by the functions of certain roles. Along with this, there are changes in the structure of the competitive activities of elite volleyball players, resulting the game in attack and defense. This necessitates the search for new approaches regarding improving technical and tactical preparation of players in various roles in volleyball. *Material.* The study involved 128 elite volleyball players of the leading teams in the world at the age of 18-30 years. We analyzed the performance of technical-tactical actions in the attack of elite players in the world according to performances at major international competitions: the 2012 Olympic Games, the 2010-2015 World Championships, the 2010-2015 European Championships, the 2010-2015 World League (60 analyzed games). *Results.* The formula and scale for evaluating players' technical-tactical preparedness in terms of their competitive activities (efficiency of attacking actions, pass efficiency, effectiveness of technical-tactic actions in attack). The proposed program of improving technical-tactical actions in the attack of elite volleyball players of different playing roles based on pedagogical analysis and interpreting indicators of competitive activities.

Key words: volleyball, technical and tactical actions, evaluation, performance

Introduction

Currently, in team sports there is a strong rivalry in the competitions of all levels. Holding leadership positions by teams largely depends on the degree to which the system for training elite athletes, as well as the sports reserve, meets modern requirements (V.N. Platonov, 2013; Ye.V. Imas, O.V. Borisova, 2016).

Analyzing the structure of competitive activity in team sports, experts note that the technical training of individual players and the team as a whole has the greatest importance with the growth of sportsmanship (E.Yu. Doroshenko, 2014; V.M. Kostiukevych, 2014; Fellingham G., 2013). In the opinion of A.V. Ivoilov, 1991; Yu.D. Zhielieziyak, 1991; B.O. Artemenko, 2013; V.V. Gamaliy, O.L. Shlienskaya, 2016] precisely the technical and tactical preparedness evolves to the greatest extent in the development of team sports. In this direction, we have been constantly searching for new technical elements and actions, tactical options for interactions, schemes and models of the game.

The most important factor ensuring the effectiveness of competitive activities in team sports according to experts (V. Prokopovich, 2013; Marcelino R., 2012; Memmert D., 2010), considers the methodology for developing strategy and tactics of the game. Therefore, one of the ways to solve the scientific problem is an objective evaluation of the players' technical and tactical preparedness, which determines the effective management of the training process. Particularly the very important issue is to develop methods for objective evaluating the quality of athletes' gaming activities in various types of team sports (volleyball, basketball, football, handball), taking into account the fundamental differences in their competitive activities.

Hypothesis.

Applying the algorithm for improving the technical and tactical actions of elite volleyball players of different roles will increase the effectiveness of competitive activities.

The purpose of the research is to increase the effectiveness of the elite volleyball players' competitive activities in attack.

Materials and methods.

Participants. 128 elite volleyball players from the world's leading teams aged 18-30 took part in the study.

Organization of the research. The indicators of technical and tactical actions in the attack of elite volleyball players of the world are analyzed based on the results of performances at the largest international competitions: the 2012 Olympic Games. The 2010-2015 World Championships, the 2010-2015 European Championships, the 2010-2015 World League (60 analyzed games).

Results of the research.

The essence of the problem of improving the athletes' technical and tactical actions in team sports, taking into account the specifics of gaming activities, is the need to take into account highly specialized components of the gaming activities of players that determine the possibilities of achieving victory in a particular match (A.V. Bieliaiev, 2011; Yu.N. Klieschiev, 2009).

As a result of the research, we recorded and analyzed the technical and tactical actions in the attack of volleyball players on the basis of a set of the most informative indicators of attacking actions, which were subsequently used to evaluate, interpret and simulate tactical and technical actions in the attack, taking into account the game roles: attackers of the first and second tempo, 'diagonal' (Table 1).

Based on the results of analyzing the data of the conducted research, it can be stated that the players of the first rate of attack make the greatest contribution to the effectiveness of the competitive activity of elite volleyball players, realizing the technical and tactical action 'take-off', which is the basis for organizing all group tactical interactions ('wave', 'echelon', 'cross'). Volleyball players of the world elite teams have a clear tendency not only to effectively carry out defensive actions, but also to the successful use in the competitive activity of players of the second attack tempo of attacking actions from the back line of the playing field, which form the basis for performing group interaction 'echelon'.

Table 1

Indicators of technical and tactical actions in the attack of elite volleyball players of various game roles

Technical and tactical actions	Quantity of TTA of players of various game roles, n=130											
	leading volleyball players of the world (1 st -6 th places in score-table)						high-qualified volleyball players of world teams (7 th -16 th places in score-table)					
	first attack tempo		second attack tempo		'diagonal'		first attack tempo		second attack tempo		'diagonal'	
	\bar{x}	S	\bar{x}	S	\bar{x}	S	\bar{x}	S	\bar{x}	S	\bar{x}	S
Performing technical and tactical actions: 'wave'	5	0,8	10	1	10	1	1	0,1	8	0,8	9	0,3
'echelon'	–	–	6	1,1	–	–	–	–	3	0,4	–	–
'rise'	14	1,6	–	–	–	–	13	1,1	–	–	–	–
'penetrating'	2	0,5	9	1,4	9	1,4	2	0,3	9	0,9	5	0,4
'zone'	4	0,8	6	1,3	4	0,7	1	0,2	4	0,6	3	0,2
'back'	–	–	7	0,9	11	1,5	–	–	5	0,2	8	0,5
'simple'	–	–	15	0,8	5	0,5	–	–	20	1,8	19	0,6
Total:	25	3,7	53	6,5	39	5,1	17	1,7	49	4,7	45	2,0
Won balls in attack: 'wave'	3	0,6	6	0,4	2	0,2	1	0,1	2	0,4	1	0,2
'echelon'	–	–	4	0,2	–	–	–	–	1	0,3	–	–
'rise'	10	1,4	–	–	–	–	8	0,4	–	–	–	–
'penetrating'	1	0,3	4	0,4	5	0,4	1	0,1	2	0,2	4	0,2
'zone'	2	0,5	3	0,3	2	0,6	1	0,1	2	0,1	2	0,4
'back'	–	–	4	0,2	7	0,3	–	–	2	0,1	4	0,3
'simple'	–	–	3	0,3	3	0,1	–	–	6	0,3	5	0,3
Total:	16	2,8	24	1,8	19	1,4	11	0,7	15	1,4	15	1,4
Lost balls in attack: 'wave'	2	0,2	1	0,1	1	0,2	–	–	–	–	–	–
'echelon'	–	–	1	0,2	–	–	–	–	–	–	–	–
'rise'	4	0,8	1	0,1	–	–	2	0,3	–	–	–	–
'penetrating'	1	0,1	1	0,1	–	–	–	–	2	0,1	–	–
'zone'	2	0,3	1	0,1	–	–	–	–	–	–	1	0,2
'back'	–	–	2	0,1	2	0,3	–	–	1	0,1	2	0,3
'simple'	–	–	3	0,2	–	–	–	–	3	0,2	3	0,2
Total:	9	1,6	10	0,9	3	0,7	2	0,3	6	0,4	6	0,7

Note: TTA – technical and tactical actions; n – quantity of games

In the competitive activities of ‘diagonal’ players, most of the attacks are carried out by attacking hits from the depth of the court. The analysis of competitive activities shows (see Figure 2) that the best zone for volleyball players in the world is the most favorable for attacking strikers, which are 8.9% and 6.3% in terms of volume and efficiency, respectively, which is primarily due effective implementing the diagonal direction of the ball. From the sixth zone of the court, attacking hits are carried out, which, as a rule, do not carry a tactical threat and have volume indicators of 4.1% with efficiency of 2.3%, which can be explained by the difficult conditions for carrying out a stroke on the zone of the opponent's group block. The attacking actions from the fifth zone of the volleyball court are characterized by the least contribution to the overall effectiveness of the team actions: volume 2.1%, efficiency – 2.3 %.

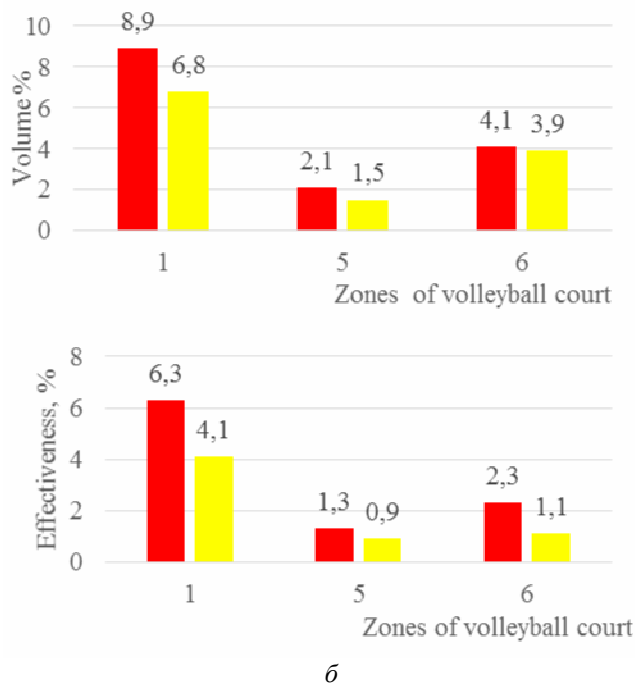


Figure 1. – Technical and tactical actions in attack, from back line of volleyball court on indicators of volume (a) and effectiveness (b):

- red bar – world high-qualified volleyball players (1st-6th places in score-table);
 - yellow bar – world high-qualified volleyball players (7th-16th places in score-table)
- 1, 5, 6 – back line zones of volleyball court

The analysis of elite volleyball players’ performances at largest international competitions indicates a tendency to increase the number of power service in the jump (54.3) with a decrease in gliding (Table 2).

Table 2

The number of passes for one game in the competitive activity of high-qualified volleyball players according to the results of official competitions in 2010-2015

Game players (quantity of games)	Quantity of services for one game					
	power service in jump		gliding service in jump			
			target		shortened	
	\bar{x}	S	\bar{x}	S	\bar{x}	S
World high-qualified players (1 st -6 th places in score-table) (n=60)	54,3	4,2	28,7	3,3	22,1	1,6
High-qualified volleyball players of Ukraine (7 th -16 th places in score-table) (n=48)	35,7	4,6	42,8	2	16	1,9

One of the means of increasing the effectiveness of the elite volleyball players’ training and competitive processes is an objective comprehensive system for evaluating their competitive activities. We have developed an integrated way of evaluating the technical and tactical actions of the team players in the attack, which includes the effectiveness of the attacking actions, the effectiveness of a service and the effectiveness of the technical and tactical actions in the attack, which directly affect the quality of competitive volleyball activity. The developed estimation method differs from the traditional one by the presence of the contribution index of the efficiency of the power service in the jump as a separate athlete, and the team as the whole, and the scales for evaluating the level of elite volleyball players’ technical and tactical actions (Table 3). The evaluation of the effectiveness of technical and tactical actions in the attack of elite players was calculated by the formula:

$$EAA = \frac{P_w + P_{ech} + P_{lift} + P_z + P_{ah} + P_p + P_s + P_{up}}{n} \cdot 100 \% \quad (1)$$

Note: EAA – effectiveness of attack actions; P – quantity of won balls using: P_w – group tactic ‘wave’; P_{ech} – group tactic ‘echelon’; P_{lift} – technical and tactical action ‘rise’; P_z – technical and tactical action ‘zone’ P_{ah} – attack hits from back line of volleyball court; P_p – technical and tactical action ‘penetrating service’; P_s – technical and tactical action ‘simple’; n – total quantity of technical and tactical actions in attack

Table 3

Levels of evaluating effectiveness of technical and tactical attack actions of volleyball players of leading teams

Indicator	Significance of indicators, %		
	EAA	SE	ETTAA
Low level	≤36,8	≤4,3	≤40,2
Below-average level	36,9–37,6	4,4–6,5	40,3–44,3
Average level	37,7–39,4	6,6–8,4	44,4–48
Above-average level	39,5–40,2	8,5–10,1	48,1–50,6
High level	≥40,3	≥10,2	≥50,7

Note: EAA – effectiveness of attack actions; SE – service effectiveness; ETTAA – effectiveness of technical and tactical actions in attack

The proposed evaluation methods make it possible to perform calculations of the effectiveness of various technical and tactical actions for volleyball players of various roles and teams as the whole, and also to calculate the effectiveness of each technical element of the attack separately (individual and group technical and tactical actions, service) in order to determine objective indicators of the quality of the training process and competitive activities. The use of this evaluation method (Kostiukevich V.M., 2014) also allows developing optimal tactical options for conducting a sports duel, taking into account the players’ individual characteristics. The results of the analysis of technical and tactical actions in the attack of volleyball players of the world's leading teams made it possible to quantify them, based on which group, individual and generalized models of the volume and effectiveness of technical and tactical actions of players of different roles were developed. This made it possible to quantify the effectiveness of technical and tactical actions of players of teams of different qualifications, determine the specific application of these actions depending on the game situation, compare each other and develop training programs to improve the technical and tactical skills of qualified volleyball players. The playing roles of elite volleyball players were divided according to the functions that they performed directly in the process of competitive activities: players of the first attack rate, players of the second attack rate (‘finishing’ players) and ‘diagonals’.

While developing group, individual and generalized models we used the average indicators of technical and tactical actions in the attack carried out by the world's leading volleyball players according to the results of the 2010-2015 official international tournaments. Group models of the effectiveness of technical and tactical actions in the attack of second line players in volleyball for the results of official competitions of elite volleyball players of the world are presented in Fig. 2.

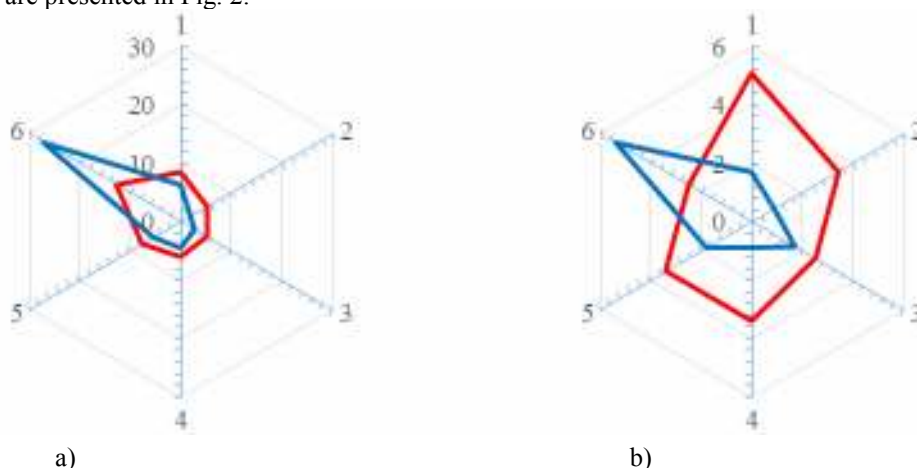


Figure 2. – Group models of applying technical and tactical actions in attack by elite volleyball players (playing role – ‘finishing’) on indicators of volume (a) and effectiveness (b), %:

— volleyball players taking 1st-6th places in world classification;
 — volleyball players taking 7th-16th places in world classification;
 1 – ‘wave’; 2 – ‘echelon’; 3 – ‘zone’; 4 – attack hits from back line of volleyball court; 5 – ‘penetrating’, 6 – ‘simple’

The role of the "finishing" player differs from the others in the presence of technical and tactical actions in the attack tactical interaction "echelon", the final phase of which is carried out due to the implementation of

the attacking hit from the depth of the court (sixth zone) because of the back of the first attack rate player performing distractions. The volume of this technical and tactical action is 5.1%, efficiency – 3.4%, which indicates a high probability of winning the ball in these conditions. The greatest contribution to the effectiveness of competitive activities ‘finishing’ players perform due to the implementation of group tactical interaction ‘wave’, the volume of which is 8.5% with efficiency – 5.1%. The individual technical and tactical "zone" effect is basically performed between the third and fourth zones with active simulation actions of the first attack rate, which creates conditions for the implementation of the attack in the presence of a single block of the opponent. The volume of this action is 5.1%, efficiency – 2.5%. Attacks from the back line of the volleyball court, which amount to 6% of the total number of attacking actions, are performed by the ‘finishing’ players mainly from the sixth zone, which does not present difficulties for their opponents, and as a consequence – they do not carry a tactical threat. The effectiveness of these technical and tactical actions is 3.4%. With the implementation of this type of attacking hits, rivals scored the largest number of lost balls because of a successfully organized block. Technical and tactical actions ‘simple pass’ and ‘penetrating pass’ in the arsenal of attacking players of the second attack rate have the largest volume – 7.7% and 12.8% at efficiency – 3.4% and 2.5% respectively, which indicates a low level of tactical threats in the application of these technical and tactical actions. The results of analyzing the competitive activities of elite volleyball players indicate that in the arsenal of ‘diagonal’ players (Figure 3) the most effective are attacking strokes carried out from the back line of the court, whose volume is 9.4%, efficiency is 5.9%. The volume of tactical interaction "wave" reaches 8.5%, efficiency – 1.7%. The indicator of the volume of technical and tactical action ‘penetrating pass’ and ‘simple’ among elite volleyball players of the world is 7.7% and 4.3%.

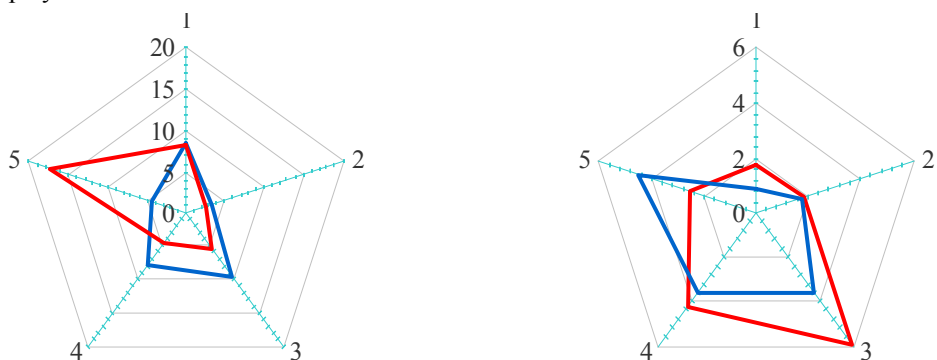


Figure 3 – group models of applying technical and tactical attack actions by elite volleyball players (playing role – ‘diagonal’) on indicators of volume (a) and effectiveness (b), %:

- volleyball players taking 1st-6th places in world classification;
- volleyball players taking 7th-16th places in world classification;
- 1 – ‘wave’; 2 – ‘echelon’; 3 – ‘zone’; 4 – attack hits from back line of volleyball court; 5 – ‘penetrating’, 6 – ‘simple’

It should be noted that the effectiveness of technical and tactical action ‘penetrating pass’ is the second in the ranking of the balls won by players of this type of role and is 4.2%. Technical and tactical actions ‘simple’ have a winning result in 2.5% of attacks.

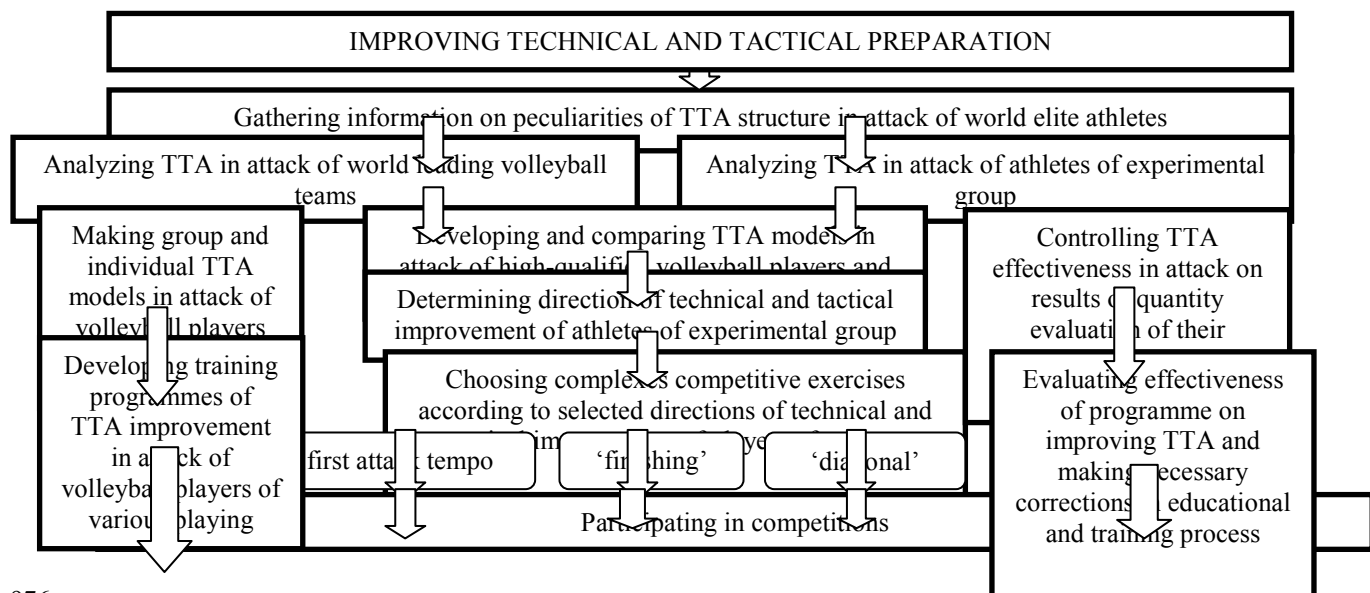


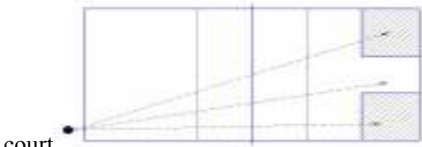

Figure 4. Algorithm of programme of improving technical and tactical actions in attack of elite volleyball players

Given the general provisions of the theory of preparing athletes and the results of their own research, we have identified the most effective means of correcting the training process aimed at increasing the effectiveness of competitive activities in volleyball based on using model indicators of technical and tactical actions of players of different roles and developed a programme to improve the technical and tactical training of volleyball players of different play roles and we designed the programme of improving elite volleyball players' technical and tactical preparation, whose algorithm is shown in Fig. 4.

The proposed program to improve technical and tactical actions in the attack of highly qualified volleyball players is based on the defining model indicators of attacking of the best teams in the world (Brazil, Russia, Germany and Italy). The programme contains complementary components, according to the objectives of the general theory of training athletes, and the main component of this development is the selection of means and methods for improving the attacking actions of highly skilled volleyball players of different roles, as the main means of correcting the training process in volleyball.

Table 4

Content of the main part of a training class aimed at improving attack hits from back line of volleyball court and power service in jump

Methods	Ways of improving	Dosage	Organizational and methodical instructions
Training class: 4			
Revising conditioned actions in certain game situations	<p>Exercise 1. A player performing power service in jump performs this technique in the designated corridors in the 1st and 5th zones of the court</p> 	10 direct hits	Instead of a separate corridor, you can use skittles, or other equipment
Combining alternative actions in opposing the opponent	<p>Exercise 2. In the exercise there involved three players - two attackers and one linking player, performing transfers from both sides of the court. The ball is pulled into the game by service. The player on one side receipts the ball with a subsequent attack from the back line, taking into account the playing of a single block located between zones 3 and 4 of the court</p> 	20 attack hits	If the ball is lost after the first draw, the coach enters a new one. Pay attention to the duration of the exercise and the technique of performing game reception
Modelling a probabilistic sequence of applying technical and tactical actions from the back line of the court	<p>Exercise 3. Players are located in the initial placement (each in its own zone). The ball is inserted into the exercise by means of a service, performed only on one side. Under the condition of quality ball reception, the point player must use the players of the first and second tempo in realizing the tactic 'echelon'. In the case of "downed" reception, the attack is performed on the edges of the net.</p>	20 times	Pay attention to the interacting the players of the first and second attack tempo in implementing the group tactical action "echelon"

Fragment of the main part of the training session, aimed at improving the accuracy of the performance of the power pass in the jump to different zones of the volleyball court, is set out in Table. 4. The results of the analysis of the competitive activities of elite volleyball players indicate that the majority of attacking hits from the back line of the court are performed in conditions of an organized block of the opponent. Therefore, one of the main tools that increases the effectiveness of attacking actions is the use of game exercises in various variations, taking into account the opponent's oppositions (exercise number 2).

The third exercise of the training session is of the greatest practical importance due to the increased intensity performing technical and tactical actions due to the reduction of the rest stops, and thus creates the conditions for improving the technical and tactical training of qualified volleyball players close to the

competitive ones. As a control, it is necessary to take into account the number of successfully performed technical and tactical actions in the attack.

The effectiveness of the results of experimental research allows us to state that the proposed programme for improving technical and tactical actions in the attack of elite volleyball players of different roles, developed on the principles of a program-objective approach, corresponds to the basic provisions of the general theory of training in the Olympic and professional sports and with appropriate adaptation to a specific sports game with taking into account the general patterns inherent in the game sports (basketball, handball, rugby, ice-hockey, football, etc.), it can be used by in other team games.

Conclusions

1. Analysis and generalization of the data of special scientific and methodological literature, the experience of leading specialists in improving sports skills of elite athletes in team games shows that technical and tactical preparation is the main factor that affects the achievement of high sports results.

2. The solution of the problem of technical and tactical improvement of high-qualified volleyball players is embodied in developing the programme for improving the attacking players' actions based on defining the arsenal of group and individual technical and tactical actions in the attack, systematization and quantitative analysis of the attacking actions of elite volleyball players, modelling the attacking actions and the use of specially-gaming exercises aimed at correcting the technique of attacking hits, which are performed from the back line of the court and the power pass in the jump.

3. The algorithm of the programme for improving technical and tactical actions in the attack of elite volleyball players of different roles should include the following components: gathering information about the specifics of the structure of technical and tactical actions in the attack by leading volleyball players of the world; comparative pedagogical analysis of the competitive activities of volleyball players of different roles; applying the integral method of evaluating the effectiveness of competitive activities in volleyball; defining and comparing pedagogical analysis of model indicators of technical and tactical actions in the attack of volleyball players of different roles; using specialized means of correcting the training process in volleyball in order to eliminate drawbacks and improve the effectiveness of competitive activities

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