

Planning efficiency of athletic preparations of highly qualified volleyball players in annual macro-cycle

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Abstract

Purpose. The article investigates the dynamics of planning and the implementation of various types of athletic trainings of highly qualified teams in volleyball.

Material. The worksheet of the trainer, in which it was proposed to indicate the percentage ratio of general and special physical training. Analysis of planning athletic training. Tests for measuring the level of athletic fitness and processing of research materials using methods of mathematical statistics.

Results. Common feature for all teams is large volumes of general physical and special training in preparation period compared to the competition season. For all teams during the competitive season, regardless of which league they perform for, less workload is planned for general physical (30.8%) and special (28.6%) training, and the dynamics here are characterized by wave-like fluctuations and slight peaks throughout all mesocycles. Hopping training is planned at 11% of the total volume of general physical and special training. An increase in the volume of non-specific load indicates a shift in emphasis in the training of volleyball players towards athleticism, which corresponds with contemporary trends in the development of volleyball.

Conclusion. As a result of the experiment, the optimal parameters of the volumes of percentage planning of general, special and jump training in the competitive season of the annual macrocycle were revealed.

Key words: training, hopping training, annual macrocycle, mesocycle, competition period, dynamic stress load.

Introduction

Planning is an integral attribute of competitive training activity in modern sport. Starting from youth sports, the entire training process is preceded by its planning. The final result depends on how scientifically substantiated and practically advisable the preparation process is planned, and also how accurately it is practically executed. In highly qualified teams, training planning (including athletic) is divided, as a rule, into operational, current and perspective [1, 4, 5].

The central part of the entire planning process is the current or annual planning, under which most volleyball specialists plan a large annual macro-cycle. In turn, a large macro-cycle, in accordance with the theory of sports training, is divided into three periods: preparatory, competitive and transitional. Depending on the calendar of sporting events and the possibilities of developing a sport, in volleyball a large macro-cycle can be divided into two large macro-cycles: autumn-winter and spring-summer. Each of them has a preparatory and competitive periods, interconnected by a transitional period.

Sports federations that are responsible for the development of a particular sport can put into practice any of the options. Also, the autumn-winter macro-cycle is considered the more important one, in which the country's championship and cup are held, and the spring-summer ensures the participation of teams in international competitions of various ranks –both commercial and official.

Along with planning for periods, another form of planning is often implemented – meso-cycles. To ensure integrity and a higher degree of visibility, a meso-cycle planning form is preferable. This led to the use of this form of planning in our study.

The **aim** of the study was to find the optimal distribution of athletic training volumes by meso-cycles during the annual macro-cycle of highly qualified teams.

Material and Methods

The worksheet of the trainer, in which it was proposed to indicate the percentage ratio of general and special physical training to the total volume of load during the entire one-year macro-cycle, as well as the percentage ratio of the volume of jump training to the total volume of general and special physical training. 2. Analysis of the scope of planning athletic training for the most successful teams.3. Tests for measuring the level

of athletic fitness: running 92 m, sec; flexibility, cm; maximum reach, cm; separation height, cm; serial jumps. 4. Processing of research materials using methods of mathematical statistics: calculation of average indicators, standard deviation and t-criterion of the student.

The study involved coaches of 36 highly qualified teams playing in the championships of Kazakhstan (20 teams), Russia (11 teams), Belarus (4 teams), Bulgaria (1 team). According to the level of qualification, male and female teams were distributed as follows: national league - 11 (6 men and 5 women); major league - 11 (5 men and 6 women) and the first league - 14 (8 men and 6 women).

Results and discussion

Table 1 presents the average indicators of the volume of general physical preparation (GPP) in relation to the total volume of the load planned in the annual macro-cycle.

Table 1 - Average GPP as a percentage of the total load in an annual macrocycle

Team level	Meso-cycles of the annual macro-cycle											
	aug.	sep.	oct.	nov.	dec.	jan.	feb.	march	apr.	may	june	july
First league, %	25,4	47,1	30,7	25,7	23,2	29,3	22,9	22,1	20,0	22,9	16,8	4,29
Major league, %	35,9	37,7	42,7	36,4	34,1	40,5	36,4	35,9	39,1	36,4	31,8	6,36
National league, %	36,8	35,9	31,2	29,8	26,6	30,3	30,3	29,8	27,5	36,4	41,8	9,09

The dynamics of these indicators, reflected in Figure 1, testifies to the wave-like nature of their planning in the annual macro-cycle. For the teams of the first league, the peak load falls on September, then there is a sharp decrease followed by stabilization until the end of the annual macro-cycle in the presence of small fluctuations. The average annual GPP indicator amounted to 26.4% of the total annual load (290 hours GPP).

As for the planning in the teams of the major league, there are no pronounced peaks. The greatest load falls in contrast to the teams of the first league in October, but it is clearly less than in the teams of the first league. On the whole, the average annual indicator amounted to 37.5% of the total annual total load of the GPP (413 hours). In the national league, the peak of the load on the GPP is planned for June - 41.8%, when the teams have already begun to implement the international calendar of competitions. During the preparatory and competitive periods, the average annual rate was 33.3% of the total annual total load of the GPP (366 hours). Summing up the GPP analysis, we can say that in general for all levels of teams its volume is 32.4% of the total annual load. This contradicts the data presented in the educational and methodical literature on volleyball [7]. At the same time, given the shift in the emphasis of training towards athleticism, such an increase in the load seems justified.

The planning of monthly volumes of special physical training (SPT), presented in Table 2 and Figure 2, is generally somewhat inferior to the volume of GPP. The first league curve indicates the highest load falls on the final meso-cycle of the preparatory period, and then it stabilizes and, apart from a small peak in February, remains until the end of the competition period. The average monthly volume of SPT is 28.3% of the total annual load of SPT (312 hours).

Table 2 - Average indicators of SPT volume as a percentage of the total load in a yearly macrocycle

Team level	Mesocycles of the annual macrocycle											
	aug.	sep.	oct.	nov.	dec.	jan.	feb.	march	apr.	may	june	july
First league, %	16,8	29,6	37,1	32,5	30,0	29,3	35	31,1	28,6	24,6	15,4	2,1
Major league, %	29,5	35,5	35,5	35,5	31,8	30,0	32,3	27,7	28,2	29,1	25,0	3,6
National league, %	33,6	39,1	29,3	29,3	26,1	25,6	26,1	26,1	25,2	28,6	20,0	2,7

The smallest fluctuations in planning the monthly volume of SPT hours are observed in the major leagues. A peculiar load plateau is observed from September to November, after which a gradual decrease occurs, and in May the hours again reach the initial level of the preparatory period. The average monthly volume here is 31.3%. It should be noted that in the Premier League, there is also a larger volume planned for SPT than 344 hours in the first and national leagues.

In the national league, the SPT hours are the same as in the first league - 312 hours, but the highest peak of the load is planned for October. Later, there is a decrease and stabilization. In May, a slight increase in load is noticeable, and in July, the volume of SPT is at a minimum. This is explained by the fact that most of the teams go on vacation, and only individual teams continue to participate in international tournaments. The average monthly volume is 28.3%.

In general, the planned volume of SPT for all levels of teams is less than the volume of GPP, and this, too, is most likely due to the growing trend of the training process towards athleticism.

Planning for jumping training in volleyball has been singled out. In accordance with research, it is hopping stamina that is the most important factor in the effectiveness of team play activity [2, 3, 6, 8]. According to A.V. Belyaeva et al, a decrease in the level of jump endurance instantly leads to a decrease in the functionality, effectiveness of attacking strikes and innings in a jump [2, 9].

From the indicators of planning of jump training and their dynamics during the one-year macro-cycle for teams of various levels shown in Table 3 and Figure 3, it can be seen that the teams of the first league are significantly inferior in the volume of hours (94.7 hours) to the teams of the highest (140.7 hours) and the national league (138.3 hours). The confidence level in both cases is $P < 0.01$.

Table 3 - Average indicators of the volume of jump training as a percentage of the total volume of general and special physical training in an annual macro-cycle

Team level	Meso-cycles of the annual macro-cycle											
	aug.	sep.	oct.	nov.	dec.	jan.	feb.	march	apr.	may	june	july
First league, %	8,4	9,9	13,6	9,5	7,1	9,9	9,5	7,6	7,4	6,9	3,5	1,4
Major league, %	19,3	14,4	14,1	12,1	10,1	11,0	12,0	9,9	12,4	13,8	9,0	2,7
National league, %	18,4	13,4	12,2	10,8	12,6	12,4	11,6	10,2	10,4	11,6	10,5	4,3

Interestingly, the peak load in the teams of the major and national leagues falls on August, and in the first league on October. This is due to the difference in the championship formulas for each of the leagues. In the first league, the championship formula is much simpler and shorter in terms of time. It should be noted that these peaks are insignificant and are dictated by apparently characteristic planning features inherent in each team. Summarizing the results of the analysis of the planning of athletic training of highly qualified teams, it should be said that there are no fundamental differences between the leagues (with the exception of jump training) or within each of them. To achieve the goal of the study, we analyzed the planning of teams that successfully and stably performed throughout the entire one-year macro-cycle to find out how many percent of the time they spend on the athletic training, taking into account current trends in the development of volleyball.

The analysis demonstrated that the greatest amounts of loads are planned by trainers in the preparatory period in order to achieve the best state of athletic readiness of the team for the start of the competitive season (championship), after which the amount of load is purposefully reduced in order to maintain the optimal mode of functional and physical activity throughout the championship. Trainers pay particular attention to the maintenance of hopping stamina. They all understand that as soon as the jump reduces, the effectiveness of gaming activity immediately decreases.

The data of one of the successful teams are as follows: 10% are planned for the GPP, -15% for the SPT and 15% of the total volume of the GPP and SPT for jumping training. These indicators became the basis for an experiment in which one of the teams was asked to form an experimental group of 14 volleyball players and to implement the above-mentioned option for planning athletic training. Another team of the championship of the Republic of Kazakhstan was proposed to form a control group, also consisting of 14 volleyball players. The planning for the athletic training of the control group was as usual. Prior to and at the end of the season, both groups were tested on a set of complex activity tests listed in the research methods. These tests fully characterize the level of athletic training, reflecting the specifics of volleyball.

The test results showed that before the start of the experiment, the groups did not statistically differ from each other in the level of development of physical activity level. The data are presented in table 4.

Table 4 - Differences in athletic fitness of the experimental and control groups before the experiment

Tests	Experimented group		Controlled group		t	P
	\bar{X}	S_x	\bar{X}	S_x		
Herringbone running 92 m, sec	25,9	1,73	26,1	1,5,2	-0,328	-
Flexibility, cm	21,0	2,17	20,7	2,22	0,361	-
Maximum length of reach, cm	295,7	6,76	291,3	5,38	1,913	-
Separation height, cm	59,5	3,96	60,2	2,91	-0,534	-
Long jumps, cm	220,3	9,2	219,7	7,66	0,187	-
Serial jumps	65,1	4,8	66,4	5,5	-0,667	-

After completion of the experiment, from the data which are presented in Table 5, it can be seen that in the experimental group for 4 indicators there was an unreliable decrease, one indicator remained at the same level (separation height according to V. Abalakov), and for serial jumps, there was some improvement (by 0, 3 times). In the control group, 5 out of 6 indicators actually decreased and only slightly improved flexibility. In general, the experimental group significantly exceeded the control in 5 indicators.

Table 5 - Differences in athletic fitness of the experimental and control groups after the experiment

Tests	Experimented group		Controlled group		t	P
	\bar{X}	S_x	\bar{X}	S_x		
Herringbone running 92 m, <i>sec</i>	26,0	1,69	27,3	1,19	3,203	0,01
Flexibility, <i>cm</i>	20,9	1,96	21,4	2,27	0,625	-
Maximum length of reach, <i>cm</i>	296,8	4,76	290,5	4,21	2,529	0,05
Separation height, <i>cm</i>	59,0	4,80	54,2	3,77	2,945	0,01
Long jumps, <i>cm</i>	217,9	10,2	210,1	9,51	2,091	0,05
Serial jumps	65,4	7,8	58,5	4,6	2,433	0,05

This fact indicates that the used option for planning athletic training of the experimental group is more optimal and appropriate than the option for planning of the control group. A good confirmation of this can also be the identification of differences between the indicators of the control group before the experiment and after its completion, which are presented in table 6.

Table 6 - Differences in athletic fitness indicators of the control group before and after the experiment.

Tests	Before the experiment		After the experiment		t	P
	\bar{X}	S_x	\bar{X}	S_x		
Herringbone running 92 m, <i>sec</i>	26,1	1,5,2	27,3	1,19	-2,307	0,05
Flexibility, <i>cm</i>	20,7	2,22	21,4	2,27	-0,833	-
Maximum length of reach, <i>cm</i>	291,3	5,38	290,5	4,21	0,437	-
Separation height, <i>cm</i>	60,2	2,91	54,2	3,77	4,688	0,001
Long jumps, <i>cm</i>	219,7	7,66	210,1	9,51	2,945	0,01
Serial jumps	66,4	5,5	58,5	4,6	3,089	0,01

For four out of six indicators (herringbone running 92 m, separation height according to V. Abalakov, long jumps and serial jumps), there is a reliable difference in the worsened figures and an unreliable decrease in the "maximum length of reach". The last three indicators from the table are especially important for athletic readiness. Only flexibility has improved slightly, i.e. in fact, it remained unchanged.

Thus, the conducted experiment yielded positive results in the experimental group. The team maintained the level of athletic training planned for the annual macro-cycle throughout the entire competitive season, having managed to maintain the athletic condition achieved in the preparatory period. According to the head coach, until the very end of the season, the team showed a high degree of jump endurance and functional performance, which helped them to successfully compete in the championship.

Conclusion

Teams of all three levels showed the wave-like dynamics of the planned and implemented load for all types of athletic training throughout the entire competitive season: general training, special training and jumping.

When planning and implementing the load in most teams, there is an increase in its volume in general physical and a decrease in special training, and in general an increase in the amount of load on athletic training. Recommended indicative volumes by Yu.D. Zheleznyak were exceeded on average by 15% in terms of physical fitness and 10% in terms of physical fitness, which indicates a shift in the emphasis of training volleyball players towards athleticism.

Uniform (according to meso-cycles) distribution of the planned load volume throughout the entire competitive season in the proportion: GPP-10%, SPT -15% of the total annual load and for jump training 15% of the total volume of GPP and SPT, allows you to maintain what was achieved in the preparatory period level athletic fitness, functional performance and the effectiveness of action during the game.

Reference

1. Andrushhishin, I.F., & Il'jushhenko K.V. (1999). Volejbol: uchebnik dlja fizkul'turnyh vuzov [Volleyball: a textbook for physical education university]. Almaty: KazIFK, FVR, p. 115-127.
2. Beljaev, A.V. (2004). Pryzhkovaja podgotovka kvalificirovannyh volejbolistov v podgotovitel'nom periode (metodicheskaja razrabotka dlja trenerov klubnyh komand i DJuSSH) [Jumping training of qualified volleyball players in the preparatory period (methodological development for coaches of club teams and youth sports school)]. Moscow, 15 p.
3. Beljaev, A.V., & Savin, M.V. (1997). Postroenie trenirovochnogo processa na sborah po OFP u kvalificirovannyh volejbolistov. Metodicheskaja razrabotka dlja trenerov klubnyh komand. Moskva, 23 p.
4. Volejbol (2000). Uchebnik dlja institutov i akademij fizicheskoj kul'tury [Textbook for institutes and academies of physical education] Ed. Red: A.V. Beljaeva, M.V. Savina. Moscow: Fizkul'tura, obrazovanie i nauka, p. 267-288.

5. Volejbol (1985). Uchebnik dlja in-tov fiz. kul't [The textbook for in-t physical. Cult / Ed. Yu. N. Kleshcheva A.G. Airiyantsa - 3rd ed., Rev., Ext. Moscow: Fizkul'tura i sport, p. 173-196.
6. Volejbol (2004). Primernaja programma sportivnoj podgotovki dlja specializirovannyh detsko-junosheskih sportivnyh shkol olimpijskogo rezerva (jetapy sportivnogo sovershenstvovanija) shkol vysshego sportivnogo masterstva [An exemplary program of sports training for specialized children and youth sports schools of the Olympic reserve (stages of sports development) of schools of higher sports skill]. Moscow: Sovetskij sport, 96 p.
7. Zheleznyak, Ju.D. (1988). Junyj volejbolist. - Uchebnoe posobie dlja trenerov [Young volleyball player. - Study Guide for Trainers]. Moscow: fizkul'tura i sport, p. 169-172.
8. Markov, K.K., Nikolaeva, O.O., & Kudrjavcev M.D. (2018). Jeksperimental'nye issledovanija optimal'nyh trenirovochnykh nagruzok pliometricheskoj pryzhkoj podgotovki v volejbule //Sovremennye naukoemkie tehnologii [Experimental studies of optimal training loads of plyometric jump training in volleyball // Modern high technology.]. 4, p. 174-178.
9. Fetisova, S.L. (1988). Metodika kompleksnogo kontrolja za fizicheskoj podgotovlennost'ju volejbolistok vysokoj kvalifikacii /Sb. nauch. trudov Osobennosti kompleksnogo pedagogicheskogo kontrolja v sportivnyh igrah [Methodology of comprehensive control over the physical fitness of highly qualified volleyball players / Sat. Scientific Proceedings Features of integrated pedagogical control in sports games]. – Leningrad, p. 29-35.