



ORIGINAL SCIENTIFIC ARTICLE

ASSESSMENT OF TRAINING LOADS OF HIGHLY QUALIFIED BASKETBALL PLAYERS

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Abstract

The purpose of the study is: 1) development and unification of a system of training loads monitoring by the nature of the physiological impact on the basketball players' body; 2) study of the strategy of preparing a highly qualified basketball team for important international competitions, namely: to find out the nature of the distribution of means of different physiological, as well as technical-tactical and game orientation at different stages of preparation; 3) test basketball players before and after training.

Materials and methods. A team of highly qualified basketball players (masters of sports and masters of sports of international class) in the number of 15 people participated in the research. The assessment of physical load by the nature of the physiological impact on the body of basketball players during 18 microcycles using 4 – 1 system, that is, 4 working days and 1 day off, was carried out. Athletes were tested before and after training.

Results. The dynamics of the means of training by the nature of the physiological impact on the athletes' body have been established. The nature of the distribution of means at different stages of preparation has been established. The test results before and after training are shown.

Conclusions. The research results showed that a certain accounting system based on assessments of the nature of the tasks to be solved and the degree of compliance with the specifics of their game activities has developed in basketball. At the same time, research have indicated the need for accounting and analyzing of the training loads by the nature of physiological impact on the body of athletes.

Keywords: basketball, training loads, highly qualified basketball players.

Introduction

In the theory and practice of basketball, the issues of planning and managing the training process are resolved, as a rule, based on the experience and intuition of coaches (Kondrashin & Koryahin, 1978; Koryahin, 2018; Anastasiadis, 2006).

Effective management of the training of basketball players is possible only when solving the following tasks (Kondrashin & Koryahin, 1978; Koryahin, 1998): 1) creation of a unified system of accounting and analysis of the training loads; 2) determination of the most effective means and methods of training; 3) optimization of the construction of the training process, i.e. finding ways of the most rational distribution of means and methods of training at different

stages of training; 4) development and unification of the system of control over the level of training of basketball players.

The first step towards creating a unified system of accounting and analysis of the training loads can be the classification of exercises used as training tools according to certain characteristics (Altberg, 1971; Poplavsky, 2004; Semashko, 1976).

The systems developed earlier were built on the basis of assessments of the nature of the technical-tactical tasks being solved and the system of their compliance with the specifics of the game activity of basketball players (Raiola, Altavilla, Tafuri, & Lipoma, 2016; Ben Abdelkrim, Castagna, El Fazaa, & El Ati, 2010; Gonzalo-Skok, Sánchez-Sabaté, Izquierdo-Lupón, & Sáez de Villarreal, 2019). Another approach to systematization is based on accounting of the physiological impact of loads on the body of athletes (Hoare, 2000; Montgomery, Pyne, & Minahan, 2010; Ciuti, Marcello, Macis, Onnis, Solinas, & Lai, 2009).

When establishing the gradations of training loads in basketball, two fundamental approaches can be used (Kon-drashin & Koryahin, 1978):

1. Systematization of exercises, taking into account the characteristics of physical loads.

2. Gradation of loads on the base of accounting of physiological changes in the body of athletes that occur when performing exercises.

However, in basketball, such a determination of the parameters of physical exertion is not always possible and a greater priority should be given to the accounting of the physiological reactions of the body that occur during physical loads. Based on the established ratios between the indicators of physical load and physical shifts in the body, all exercises used in the training of highly qualified basketball players were divided into 4 types of training loads:

1. Aerobic exercises.
2. Exercises of mixed aerobic-anaerobic orientation.
3. Exercises of anaerobic-alactate orientation.
4. Exercises of anaerobic glycolytic orientation.

It should be noted that the determination of the immediate training effect of special exercises and their systematization by the nature of the physiological impact do not yet determine how rationally it will be built as a whole. The main question in this problem is: which and in what volume the exercises should be used? Therefore, it is important to find out what is the strategy of training in basketball, what means are given more attention, what are the dynamics of these means at different stages of training? Clarifying these issues allows us to summarize previous experience and subsequently make adjustments to the training process.

Materials and methods

Participants and research organization

A team of highly qualified basketball players (masters of sports and masters of sports of international class) in

the amount of 15 people took part in the research during the period of preparation for important international competitions. During the training period, a 4–1 microcycle was used, that is, 4 working days and 1 day off. A total of 18 microcycles were performed. During the training period, basketball players were tested in order to determine the level of their physical and technical preparedness before and after training. The following tests were used: 6 m and 20 m run, jumping height, shots from the spot (the number of hits out of 40 shots and the time of operation were determined), free throws out of 30 (number of hits), running across the court from one front line to another 3 times for 40 seconds after 1 minute of rest (number of meters covered), Cooper test (Koryahin, 1998; Koryahin, Hrebinka, Prystynskyi, & Prystynska, 2022).

Statistical analysis

To maintain a laboratory journal, to perform operations on sorting the results obtained and their storage, and to calculate statistical data, the MS Excel program was used. The choice of mathematical statistics methods was an adequate to the goals and objectives of our study and included the use of the following methods: the arithmetic mean of the primary data, the error of the average value, the standard deviation and the reliability of the difference between the data obtained.

Results

The results on the distribution of means of different physiological orientation are presented in Fig. 1

As can be seen from Fig. 1, the volume of means of aerobic impact gradually increased from stage to stage, but decreased noticeably during the period of the team's participation in international tournaments (8–9, 13–16 microcycles, see Fig. 2). At the same time, the volume of aerobic-anaerobic exercises increased significantly. With the main interna-

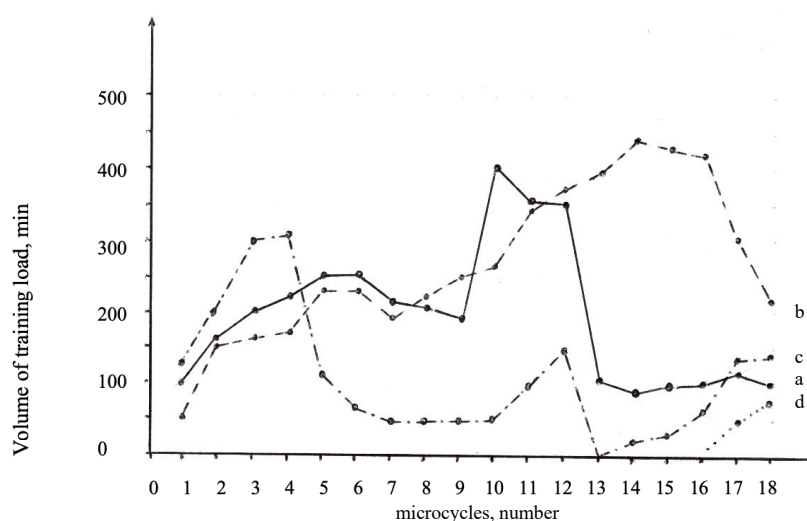


Fig. 1. Dynamics of the volume of training means of different physiological orientation, which were used during the preparation of a highly qualified basketball team for important international competitions: Ordinate axis – the volume of training load, min; Abscissa axis – microcycles, number; a – volume of training load, mainly aerobic orientation; b – aerobic-anaerobic orientation; c – anaerobic alactate and anabolic orientation; d – anaerobic glycolytic orientation.

tional competitions approaching, the volume of aerobic and mixed aerobic-anaerobic means decreased. At this stage, the volume of speed-power means (alactate anaerobic impact) increased and for the first time during the entire training period, exercises aimed at developing the speed endurance of basketball players (anaerobic-glycolytic effects) were used.

The results of the distribution of means of technical, tactical, technical- tactical and game training are presented in Fig. 2.

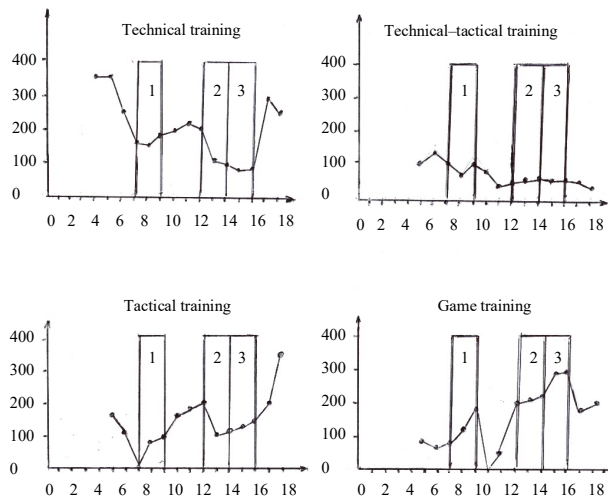


Fig. 2. Dynamics of distribution of means of technical, technical-tactical, tactical and game training at different stages of preparation of basketball players for important international competitions:

Ordinate axis – amount of time, min.

Abscissa axis – microcycles, number.

Columns in Fig. 1, 2, 3 – participation in international tournaments.

As can be seen from Fig. 2, there is a certain pattern in the distribution of means aimed at improving technical, tactical and game training. The volume of technical training gradually decreases as official responsible international competitions approach, the volume of tactical and game training increases.

The results of testing basketball players before and after the preparation for important international competitions are shown in Table 1.

As can be seen from the table, basketball players increased their performance in all tests, with the exception of jumping height. It should be noted that in such tests as the time of work in throws from spots, running 3×40 seconds, the differences are not reliable ($p < 0.95$), but, in any case, there is no decrease in indicators. There are practically no differences in the average values of jumping height indicators (1st examination – 48.8 cm, 2nd examination – 49.0 cm). Therefore, coaches should not ignore the thesis that qualified basketball players can develop jumping ability without using exercises with weights. This, of course, does not mean that you do not need to use jumping exercises in training. In addition, jumping exercises develop “explosive” strength, coordination of movements, specific skills (for example, during a jump shot, fighting for the rebound of the

Table 1. Results of control tests of basketball players before and after the preparation for important international competitions (n = 15)

Indicators	Examination		Difference reliability
	1st	2nd	
Running at 6 m, sec.	1.61±0.67 0.107	1.36±0.067 0.107	>0.99
Running at 20 m, sec.	3.55±0.079 0.125	3.06±0.168 0.267	>0.99
Jumping height, cm	48.8±4.25 6.75	49.0±4.44 7.05	<0.95
Throws number of hits	20.5±2.7 4.29	24.0±2.12 3.37	>0.95
out of 40 time of work, sec.	4.21±0.1 0.159	4.04±0.173 0.276	<0.95
Free throws out of 30, number of hits	20.1±2.51 3.99	23.5±1.73 2.76	>0.95
Running 3×40 sec., m	563±16.6 26.4	572±17.0 27.0	<0.95
Cooper Test, m	2939±87 138	3057±96 153	>0.95

ball, “scoring” the ball into the basket from top to bottom, etc.), helps to maintain the level of jumping ability. However, strength training cannot be ignored. As shown by a study by Jim Hanley, 1973, qualified athletes have fewer opportunities to increase results in jumping ability. The most effective for the strength developing, strength increasing and jumping ability in qualified athletes are exercises with large and maximum weights, which includes jumping on a bench, lifting a barbell, half-squats and deep squats. Our experiment with qualified basketball players confirms this. Physical training, which was allotted 31.9% of the time, included crosses, fartlek, gymnastic exercises, acceleration, jumping with one or both legs pushing up and moving forward, stairs, over barriers, etc. Exercises with weights were not used, which affected the results in the jumping test.

Studies have shown that it is necessary to carry out the gradation of loads based not only on traditional assessments of the nature of the technical-tactical tasks being solved, but also on the basis of accounting of the physiological impact of loads on the body of athletes. A significant contribution here can be the establishment of an urgent training effect of special exercises of basketball players and, on this basis, the creation of a unified system of accounting of the training loads, their systematization by the nature of the physiological changes that they cause in the body of basketball players.

Discussion

The question of the importance of planning and managing the training process was considered by many scientists and coaches at different stages of basketball development (Semashko, 1976; Yukhno, & Preobrazhensky, 1967; Shablinsky, 1989; Koryahin, 2018).

The results of our research coincide with a number of scientific studies (Ben Abdelkrim, Castagna, El Fazaa, & El Ati, 2010; Poplavskyi, 2004; Ferreira, Volossovitch, & Sam-

paio, 2014) on the need to develop a system for planning and managing the training load, creating a unified system for accounting and analysis of training load.

The results of our studies showed a certain accounting system has developed in basketball based on assessments of the nature of the tasks to be solved and the degree of compliance with the specifics of their game activities (Sushko & Mustafa, 2015; Mitova & Ivchenko, 2014). At the same time, studies have indicated the need of accounting and analysis of training loads by the nature of the physiological impact on athletes' bodies (Koryahin, Blavt, Doroshenko, Prystynskyi & Stadnyk, 2020; Anastasiadis, 2006).

Based on the study results, it can be stated that in order to effectively manage the training process, a certain accounting system is needed. Suchlike at this stage of scientific research is the gradation of special exercises of basketball players according to 4 groups, namely: exercises of aerobic, mixed aerobic-anaerobic, anaerobic alactate and anaerobic glycolytic orientation (Koryahin, Hrebinka, Prystynskyi, & Prystynska, 2022; Koryahin, Blavt, Prystynskyi, & Stadnyk, 2021).

The proposed system of accounting for training loads in basketball opens up new opportunities for improving the management system of training processes. Further research should be aimed at finding the nature of the interaction of urgent training effects of special exercises of basketball players and on this basis improve the system of accounting for loads by the nature of the physiological impact of the exercises used in the training of basketball players.

Conclusions

1. Studies have shown that effective management of the training process of highly qualified basketball players is possible not only on the basis of assessing the nature of the technical and tactical tasks to be solved and the degree of their compliance with the game activity of basketball players, but also, which is very important, by accounting the physiological impact of loads on the body of athletes.

2. The proposed gradation of the loads of highly qualified basketball players based on the accounting of physiological changes caused by the performance of exercises, allows effectively manage the training process.

3. Studies have shown that the dynamics of the volume of training means of different physiological orientation during the preparation of a highly qualified team for important international competitions is uneven, which affects the results of control examinations in special tests (see Table 1). Therefore, the distribution of training means at different stages of training should take into account not only technical, technical-tactical, tactical and game training, but also without fail, taking into account the nature of the physiological impact of exercises on the body of athletes.

Conflict of interest

The author declares no conflict of interest.

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ОЦІНКА ТРЕНУВАЛЬНИХ НАВАНТАЖЕНЬ БАСКЕТБОЛІСТІВ ВИСОКОЇ КВАЛІФІКАЦІЇ

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Реферат. Стаття: 5 с., 1 табл., 2 рис., 22 джерела.

Мета дослідження: 1. Розробка і уніфікація системи контролю за тренувальними навантаженнями за характером фізіологічного впливу на організм баскетболістів. 2. Дослідити стратегію підготовки баскетбольної команди високої кваліфікації до відповідальних міжнародних змагань, а саме: з'ясувати характер розподілу засобів різної фізіологічної, а також техніко-тактичної і ігрової спрямованості на різних етапах підготовки.

Матеріали і методи. В дослідженнях брала участь команда баскетболістів високої кваліфікації (майстри спорту і майстри спорту міжнародного класу) у кількості 15 осіб у період підготовки до відповідальних міжнародних змагань. У період підготовки використовувався мікроцикл 4-1, тобто 4 робочих дні і 1 вихідний. Усього було проведено 18 мікроциклів. У період підготовки проводилося тестування баскетболістів з метою визначення рівня їх фізичної і технічної підготовленості до початку і після закінчення підготовки. Використовувались такі тести: біг на 6 м і 20 м; висота вистрибування; кидки з точок (визначалась кількість попадань з 40 кидків і час роботи); штрафні кидки з 30 (кількість попадань); біг майданчиком від одної лицьової лінії до іншої 3 рази по 40 секунд через 1 хвилину відпочинку (кількість подоланих метрів); тест Купера (Koryahin, 1998; Koryahin, Hrebinka, Prystynskyi, & Prystynska, 2022).

Результати. Проведені дослідження показали, що ефективне керування тренувальним процесом баскетболістів високої кваліфікації можливе не тільки на основі оцінок характеру вирішуваних техніко-тактичних і ігрових задач, але й при обліку характеру фізіологічного впливу навантажень на організм спортсменів. Результати тестування баскетболістів до початку проведення й після закінчення показали, що в цілому система підготовки позитивно відобразилась на результатах у всіх тестах, окрім висоти вистрибування (перше обстеження $48,8 \pm 4.25$ см, друге обстеження – $49,0 \pm 4.44$ см, $P < 0.95$), часу роботи у кидковому тесті (перше обстеження – $4,21 \pm 0.1$ сек., друге обстеження – $4,04 \pm 0.173$ сек., $P < 0.95$), у тесті з бігу 3×40 сек. (перше обстеження – 563 ± 16.6 сек., друге обстеження – $572,04 \pm 17.0$ сек., $P < 0.95$). Це свідчить про необхідність більш ефективного, науково обґрунтованого розподілу засобів на різних етапах підготовки.

Висновки. Дослідження показали, що ефективне керування тренувальним процесом баскетболістів високої кваліфікації можливе не тільки на основі оцінок характеру вирішуваних технічних, тактичних задач й ступеня їх відповідності ігровій активності баскетболістів, але й, що є досить важливим, обліку фізіологічного впливу навантажень на організм спортсменів. Запропонована градація навантажень баскетболістів високої кваліфікації на основі обліку фізіологічних змін, що викликані виконанням вправ, дозволяє ефективно керувати тренувальним процесом. Динаміка об'ємів тренувальних засобів різної фізичної спрямованості у період підготовки висококваліфікованої команди до відповідальних міжнародних змагань, носить нерівномірний характер, що відображається на результатах контрольних випробувань у спеціальних тестах. Тому розподіл засобів тренування на різних етапах підготовки повинен здійснюватися із врахуванням не тільки технічної, техніко-тактичної і ігрової підготовки, але й у обов'язковому порядку з урахуванням характеру фізіологічного впливу вправ на організм спортсменів.

Ключові слова: баскетбол, тренувальні навантаження, баскетболісти високої кваліфікації.

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