The effectiveness of competitive activity of highly qualified basketball players is influenced by the indicators characterizing speed and strength qualities during jumps

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Abstract

Objective of the study. Within the framework of this study, the task was to establish the relationship between the speed of performing jumping movements and the success of competitive activity of professional basketball players.

Methods and structure of the study. 17 qualified basketball players took part in the scientific work. The components of the players' jump speed (reaction speed when performing a jump, the time of the motor phase of the jump, the speed of jumping, etc.) were determined based on the use of a dynamoplatform with an automated TABS system (Simulator Analyzer of Speed and Strength). The game indicators were calculated according to the statistical protocols of the games.

Results and conclusions. The effectiveness of competitive activities in modern basketball is influenced by various indicators of players' fitness. The most important of them is the speed of the jump. The study revealed a statistically significant effect of the speed of the jump on such game parameters of basketball players as the points scored in the game, the number of rebounds of the ball under the ring and the utility coefficient of the player. The survey revealed the opinion of the coaches about the importance of controlling the level of jump speed in the process of training basketball players. At the same time, almost half of the respondents noted that they experience serious difficulties in assessing this indicator. In this situation, it is necessary to search for simple tests and their scientific justification to assess the speed of basketball players' jumps.

Keywords: *the speed of jumping movements, the success of competitive activity, professional basketball players, reaction time, duration of the motor phase, speed of repulsion, game performance, game efficiency.*

Introduction. Modern basketball, in addition to the high speeds and athleticism of the players, is characterized by a large number of actions performed by basketball players in an unsupported position. Individual qualified basketball players, depending on their playing role, perform an average of more than 100 jumps per game. It is no coincidence, as our scientific analysis of the specialized literature has shown, that the study of jumping ability, to one degree or another, was carried out in more than four dozen dissertation studies on basketball, conducted in Russian. Most authors recommend estimating the maximum jump height of basketball players when monitoring their jumping ability, and only a small number of researchers mention the importance of jumping speed. In the program documents of basketball training (the SS and SSHOR programs, in the Federal Standard of Sports Training for the sport of basketball), only the control of the maximum jump height is provided. To assess jumping ability, the jump up test is used with a wave of the hands (Abalakov test), although in the educational and methodological literature on basketball, jumping over a long period is considered as the ability to perform high and fast jumps, which is very important for a successful game [5, 6].

Objective of the study. Within the framework of this study, the task was to establish the relationship

between the speed of performing jumping movements and the success of competitive activity of professional basketball players.

Methods and structure of the study. 17 qualified basketball players, players of the national team of P.F. Lesgaft National University took part in the scientific work. The average height of the players was 191.6±2.1 cm with an average weight of 84.7±1.9 kg. On a dynamoplatform, using an automated TABS system (a simulator Analyzer of Speed and Strength), basketball players studied the indicators of jump speed (reaction speed when performing a jump, the time of the motor phase of the jump, the speed of jumping, etc.) [2]. The speed of the motor reaction to a simple signal was determined by the time from the signal to the moment of separation from the support.

The complex motor reaction was determined by the time from the resolving signal to the moment of separation from the support. The total time of repulsion was determined by the sum of the times of the preparatory and motor phases of repulsion. The motor phase of repulsion was determined by the time from the beginning of leg extension to the moment of their separation from the support. Based on the data obtained, the jumping speed (the ratio of the jump height to the time of the motor phase of repulsion) and the jumping index (the ratio of the time of the unsupported phase of the jump to the total time of repulsion) were calculated. The "central delay" was determined by the difference between the time of a complex reaction and the time of a simple reaction for the same player [1, 4].

The game indicators were calculated according to the statistical protocols of the P.F. Lesgaft NSU games in the framework of the All-Russian basketball competitions among student teams (Student Basketball Association Championship) St. Petersburg division and the St. Petersburg Championship among men's basketball teams. Based on the analysis of the data from the technical protocols of 30 games, the integral KPI (player's utility coefficient) was determined according to the formula used by the Russian Basketball Federation (RFB), as well as important game indicators (points scored by the player, balls picked up under his own or someone else's shield, the total number of ball rebounds) calculated per 1 minute of the basketball player's playing time. A survey of qualified coaches (n=81) with extensive practical experience was conducted to identify the opinions of experts on the importance of evaluating jump speed and individual game indicators in the process of comprehensive monitoring of basketball players.

Results and conclusions. An analysis of the results of a survey of experts showed that a fairly large percentage (more than 40%) of basketball coaches consider it important to evaluate the speed of players' jumps in the process of comprehensive control.

In the course of the study, five components were evaluated in performing a vertical upward jump among qualified basketball players with the goal of performing the fastest jump possible (Table 1). The time of simple and complex motor reactions recorded by us during the jump turned out to be significantly longer compared to similar indicators obtained during testing on the Psychotest device.", where it was necessary to respond to a certain signal with a hand or foot by pressing a special button in a sitting position. It is likely that some increase in the basketball player's reaction time is spent on differentiating the signal to make a decision about starting a jump [3]. This increase in the time of the visual-motor reaction is explained by the complexity

Tables 1. Values of the jump speed indicators in the process of the fastest upward jump of qualified basketball players (n=17)

Indicators	The average value (M±m)
The time of a simple motor reaction to a light signal when performing an upward jump, with	0,598±0,067
The time of the complex motor reaction of the choice to the light signal when performing an upward jump, with	0,708±0,074
"Central delay" when performing a jump, with	0,110±0,031
The time of the motor phase of repulsion, with	0,187±0,042
Total time of repulsion, s	0,401±0,045
Jumping index, units.	1,349±0,185
Jumping speed, m/s	1,952±0,117

of the performed motor action and the rather large weight of the player (on average more than 84 kg), which must be moved vertically.

In order to determine the degree of influence of jump speed indicators on the effectiveness of competitive activity, we conducted a correlation analysis. The choice of analyzed game indicators was made based on the analysis of a survey of coaches, during which the priority of indicators for evaluating the effectiveness of competitive basketball players was identified. From the list obtained, the most important indicators of the basketball players' game were selected, which could be most influenced by the speed of the jump.

Analysis of the relationship between the time of motor reaction to a light signal when performing an upward jump and the values of game indicators (Table. 2), which we examined, allowed us to identify the presence of an average and weak relationship between them with three game indicators (points scored, rebounding on his shield and KPI).

It was found that the time of a complex motor reaction to a signal with a choice when performing an upward jump has a stronger relationship with game indicators (for all types of ball picking under the shield and on the KPI) than with the time of a motor reaction to a simple light signal. An average correlation was also revealed between the indicator of the total time of repulsion and such important game indicators for basketball as the selection on one's shield and KPI (the correlation coefficients turned out to be statistically significant). The influence of the jump speed indicators (the jumping index and the jumping speed) on the game indicators we analyzed was also found (Table 2).

Conclusions. The effectiveness of competitive activities in modern basketball is influenced by many indicators of players' fitness. One of the most important indicators is the speed of the jump.

The conducted research revealed a statistically significant influence of the speed of the jump on such important game indicators of basketball players as the points scored in the game, the number of rebounds of the ball under the shield and the utility coefficient of the player. A survey of coaches revealed the importance, in their opinion, of monitoring the level of jump speed during the training of basketball players, while almost half of the coaches surveyed have serious difficulties assessing the speed of the jump.

Apparently, it is necessary to search for simple tests that evaluate the speed of basketball players' jumps, as well as the scientific justification of the tests in order to widely introduce new developments into the practice of basketball players' training.

References

1. Latyshev N.V., Latyshev S.V., Gavrilin V.A. Analiz sorevnovatelnoj deyatelnosti finalistov igr HHIH Olimpiady v Pekine po volnoj borbe. Teoriya i metodika fizichnogo vihovannya. Doneck. 2008. No. 1. P. 173–180.
2. Latyshev S.V. Nauchno-metodicheskie osnovy individualizacii podgotovki borcov: dis. ... dokt. nauk po fizicheskomu vospitaniyu i sportu po specialnosti 24.00.01 – «Olimpijskij i professionalnyj sport». Kiev, 2014. 459 p.
3. Latyshev S.V. Dinamika pokazatelej zrelishchnosti sorevnovatelnoj deyatelnosti finalistov olimpiad po volnoj borbe. Teoriya i praktika fizicheskoy kultury. 2025. No. 2. P. 101–104.
4. Latyshev S.V., Gromakov A.Yu., Chocharaj Z.Yu. Sravnitelnyj analiz harakteristik sorevnovatelnoj deyatelnosti borcov volnogo stilya na Olimpijskih igrah v Atlante i Sidnee. Pedagogika, psihologiya ta metodiko-biologichni problemi fizichnogo vihovannya i sportu. Harkiv. 2001. No. 2. P. 45–52.
5. Novikov A.A. Osnovy sportivnogo masterstva: monografiya. M.: Sovetskij sport, 2012. 256 p.
6. Piloyan R.M. Uzlovye voprosy mnogoletnej podgotovki borcov: metodicheskoe posobie. M.: MOGIFK, 1988. 28 p.
7. Platonov V.N. Sistema podgotovki sportsmenov v olimpijskom sporte. Obshchaya teoriya i ee prakticheskie polozheniya. Kiev: Olimpijskaya literatura, 2004. 808 p.
8. Shahmuradov Yu.A. Volnaya borba. Nauchno-metodicheskie osnovy mnogoletnej podgotovki borcov. Mahachkala: ID «Epoha», 2011. 368 p.