

OPTIMIZING PHYSICAL TRAINING IN JUNIOR FEMALE BASKETBALL PLAYERS

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Abstract. Women's basketball has come a long way recently. Many clubs have sprung up, the number of competitions has increased and girls have started practicing and playing basketball from a very young age. In the last twenty years we have raised several generations of basketball players, generations that have won numerous national titles for CSS, but we always knew that we still had some work to do in terms of physical training. So, with the generation of girls born in 2002, we planned a training program to improve and develop physical preparation. The experiment was conducted with 14–16 year old female basketball players over a period of one year, including two final tournaments. The study was conducted in two stages: the first test was conducted in the competitive period before the U14 final tournament (February 2023), where the team lost the gold medal, and the second test was also conducted in the competitive period before the U15 final tournament (February 2024), where the team won the gold medal. Tests were conducted on 8 indicators, which provide information about the basic parameters of the preparation of the tested basketball athletes. In order to achieve the set objectives and tasks of the present study, we applied the following research methods: literature review, four anthropometric tests and 4 specific physical tests. Along with the regular basketball training, we introduced specific physical conditioning training twice a week for 6 months. Results obtained from the tests were processed, variances were analyzed, followed by a correlation analysis. The analysis of the results from the two tests established that the applied specific fitness training program had a positive impact on the basketball players' fitness, which is why we will continue to implement it further in the training process and will probably conduct a third test before the U16 final tournament.

Objectives. Optimization of the physical preparation of 14–16 year old girls from the CSS basketball team. To update and improve the preparation programs for their future training lessons following the analysis of their physical development and physical capacity.

Methods. The current study was conducted in two stages on 12 female basketball players. The first test was conducted in February 2023, in the competitive period before the U14 final tournament. The second test was conducted in February 2024, before the U15 final tournament. Prior to the study the athletes and parents completed consent statements for participation in the process of this study.

Results. Indicators for physical development at the first test are stable, with the weight index being the most variable. The group is relatively homogeneous on specific indicators (20 m sprint run, vertical jump and Adapted T-Test). The greatest variation is in the Beep Test results, indicating that the group is inhomogeneous on this indicator.

Conclusion. The analysis of the two tests shows that the basketball players obtained a better result in the second test, the applied training program had a positive effect on their physical training. The specific training program can be revised by increasing the workload and intensity of exercises

Keywords: basketball, physical training, training activity, control.



Introduction

The modern way of training and playing tends towards a perfect organization in which the players shape their activity, becoming followers of principles that give them freedom of action and decision, but they are obliged to respect the tactical ideas that make them give a collective connotation to any individual action.

World basketball is undergoing major changes in the training, work and mentality of coaches and specialists, in the attitude of players to their profession and in certain organizational aspects of the increasingly complex and busy competitive system. All these changes are also being felt in basketball activity in our country as a consequence of the gradual transition to professional basketball structures.

In performance, at all stages of development of the game of basketball there have been contradictions between the old and the new, but never have they been so evident as at the present stage. The modern training process is subject to constant renewal, based on scientific laws, and is founded by coaches and players, i.e. by practitioners who often leave behind the theoretical and methodical aspects developed by specialists. This explains why modern basketball, based on the principles of total basketball, is not the result of the application of a brilliant idea, but a collective work resulting from the accumulation of new solutions for diversifying training and the components of the game.

Any research-oriented study must start from the idea that today's basketball is being played in an obvious lack of space and time, and the theoretical aspects must discover solutions to overcome these realities that govern contemporary basketball. It is from these fundamental principles that basketball specialists, regardless of the level or age group they work with, must start.

The increasingly sophisticated training methods, the innovations made by coaches and players in the technique and tactics of the game, the emergence, amendment and supplementation of the rules of the game have all brought about changes in the content of the game. The popularity of basketball is primarily due to its essence and characteristics: attacking play, imaginative technical and tactical drills, spectacular and dynamic play, finesse and precision. The game of basketball has reached its current level of development also thanks to good organization. It was only natural that the work of one of the most popular sports should, from the outset, be well directed both globally and domestically.

The game of basketball requires a large manifestation of the physical factor, determined by the content of the effort made. The increase in motor density in each unit of time is expressed by a high volume of game actions.

Basketball players will be able to capitalize on their technical and tactical possibilities only to the extent that physical training can make its presence felt. Physical training is the basis of sports activity, this means that physical training covers a very wide range of problems and therefore work to improve and perfect it must be carried out systematically.

The importance of physical training is reflected in the influence it exerts on technique and tactics, physical training is the basis on which these two factors must be supported. The higher the physical training is raised to a higher level, the greater the possibilities for mastering and perfecting advanced technique can be ensured. And the other important factor – tactics – is directly influenced by physical training. Modern tactics based on fast actions, constant movement will yield better results only to the extent that the degree of physical fitness corresponds to these tactics.

In order to achieve the objective set by the coach at the beginning of the training, namely to obtain a medal at the end of the championship, the coach must carefully plan the training so that the team achieves the sports form in the most important phases of the championship. In order to schedule the attainment of the sports form, the coach periodizes the sports training through the 3 periods of a macro-cycle: the preparatory period, corresponding to the phase of installation or obtaining the sports form; the competitive period corresponding to the phase of valorization and manifestation of the sports form; the transition period corresponding to the phase of organized withdrawal from form and restoration of the effort capacity (Teodorescu, 2009, p. 48).

In the preparatory period, through the general (basic) training stage, the general effort capacity of the athletes is increased, developing the qualities of speed and skill, accustoming the body to high volumes of effort, which requires both aerobic and anaerobic metabolism, increasing the level of general physical preparation, creating the premises for the technical, tactical, physical and mental preparation necessary for the specific training later, then following the specific training period by developing specific complex motor skills, perfecting the technical-tactical training and specific mental preparation for competition.

Therefore, we aim to train strength development, especially in the lower limbs using specific exercises using a specific training model through periodization of tactics. Depending on the needs of the team a specific training model should be chosen. For players who have a good technique of executing the exercises, but without the necessary strength, specialists recommend starting with the combined training model. This should develop a minimum level of strength and then finish with a complex training pattern. In the order of the preparatory period, one will move from general to specific exercises (Pacholeket, M. & Zemkova E., 2020).

The issue of contemporary basketball, perfected in all its compartments, is much more complex, by the very transformations to which the game itself is subjected, being different from the one practiced only a few decades ago. The development of theoretical materials, with a predominant research attempt into the trends and prospects of the game of basketball, is one of the basic concerns of specialists in the field who, through this activity, are pushing forward the theory and method of basketball instruction. The starting point in addressing all components of training in the game of basketball and beyond is physical preparation.

And when is the best time to develop motor skills, effort capacity, to build a solid foundation for the development of bio-physical-motor potential, if not at puberty?

That is why we approached this topic, in order to identify means and methods of developing both general and specific physical training (through regular basketball training), in order to achieve sports performance by 14–16 year old basketball players.

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This research aimed to determine the anthropometric and motor differences between the two tests, obtained by the same team after the application of a physical training program on a regular basis.

The research hypothesis is that the values of the physical tests and anthropometric measurements from the second test will be much better, and these differences will justify the improvement of the result obtained at the end of the U15 Women's National Basketball Championship, respectively obtaining the gold medal.

Methodology

Participants

The research was conducted on a sample of 12 female athletes, members of the U14/U15 basketball team of the Alexandria School Sports Club participating in the National Championship in the field,

medalists at the national championships, 4 of them are members of the national team medalists at the Balkan and European championships.

All players participated voluntarily in this study, and written consent was obtained from all players before starting the study.

Testing procedures

Anthropometric measurements and physical tests took place in the same gym, before the final tournaments, respectively February 2023 (U14) and February 2024 (U15).

Measurement and recording method

In our research, basketball players were evaluated through anthropometric measurements and specific physical fitness tests that targeted: height, weight, arm span, body mass index, speed running (20 meters with a standing start), specific strength (vertical lunge), agility (adapted T-Test) and testing of aerobic endurance and maximum oxygen consumption through the Multistage 20m Fitness test performed with the Beep Test application.

The tests were carried out with the aim of finding out the level of physical development and the level of specific physical training in order to be able to make a comparison between these results and the requirements of the specialized federation (Romanian Basketball Federation).

Anthropometric examination

To determine the height and body weight, the thalimeter and electronic scales were used, to measure the arm span, the metric tape was used, and the body mass index was calculated using the Calculator.net platform

Evaluation of the level of specific physical training

Speed: running over a distance of 20 m, starting from the feet. The test was held in the gym. Timing starts when the back leg rises and stops when the performer's chest crosses the finish line. The test is performed twice and the best performance is recorded.

Testing explosive strength (vertical jump) through the Optojump system, the player has two attempts and the best attempt is recorded;



Figure 1. Explosive strength testing.

Test T-test adapted: the player will run the route in Figure 11, using forward, backward and side-stepping. The route is described by 4 milestones: between milestones A and B = 5 m, between milestones B and C respectively B and D = 2.5 m.

The player moves as follows:

- sprint forward over the distance between milestones A and B, touches milestone B with the right hand;
- side-stepping sideways over the distance between milestones B and C, touches milestone C with the left hand;
- side-stepping sideways over the distance between milestones C and D, touches milestone D with the right hand;
- side-stepping sideways over the distance between milestones D and B which she touches with the left hand;
- then runs towards milestone A

The timer starts when she lifts her foot and stops when she passes milestone A. The test is not taken into account if she crosses her legs during the movement or does not touch the milestones. The player is entitled to one attempt.

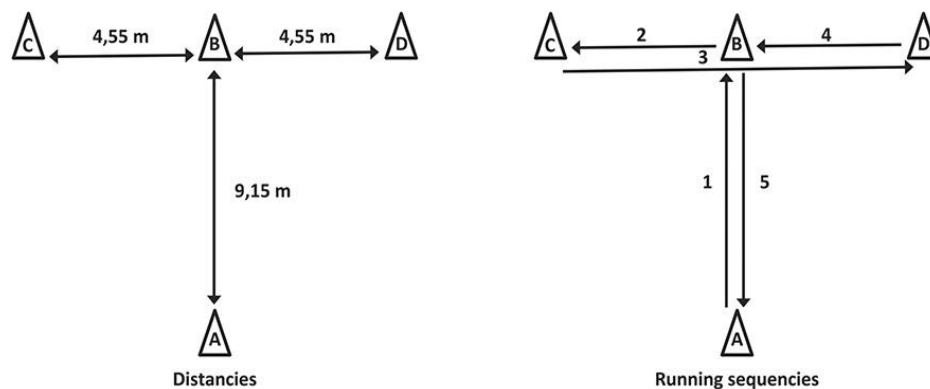


Figure 2. The adapted T-test.

Testing aerobic endurance and maximal oxygen consumption through the Multistage 20 m Fitness test performed with the Beep Test (Enterprises) application on an android device, the test started from level 1 with a speed of 8.0km/h, the distance per lap 20m;

The maximal oxygen uptake (VO₂max) is estimated.

The test is performed by continuously running between two points located 20 m apart. The movement is performed according to the sound signal played at set intervals. As the test continues, the interval between each successive beep is reduced, forcing the player to increase the speed throughout the test, until it is impossible to maintain synchronization of the player's movement with the recording. The recording is structured in 23 "levels", each of them lasting 60 seconds. Typically, the beep interval is calculated as requiring a starting speed of 8.5 km/h, increasing by 0.5 km/h with each level. Progression from one level to the next is signaled by 3 rapid beeps. The highest level reached before losing pace is recorded as the score for this test.



Figure 2. Aerobic endurance testing.

Results and discussions

The data obtained from our study indicate that the research confirms the hypothesis, which is demonstrated by the fact that the basketball players' results in the second test improved, with the team surpassing its performance achieved in the previous year.

Table 1. Results before and after program implementation

TESTS Statistical markers	20 m Test		Agility Test		Long jump	
	T1	T2	T1	T2	T1	T2
Arithmetical mean	3.87	3.82	16.15	15.85	1.77	1.86
Maximum value	0.10	0.06	0.60	0.52	0.17	0.14
Stdv	4.12	3.92	17.00	16.87	2.20	2.20
Minimum value	3.70	3.68	15.38	15.06	1.50	1.78
p	0.03		0.00		0.01	

The results recorded according to Table 1, at the end of the 5 months during which the training program was applied, showed a progress in the parameters of speed, agility and explosive strength of the lower limbs. Thus, the 20 m running speed was obtained at the initial test of 3.87 ± 0.10 s and 3.82 ± 0.06 at the final test. The mean difference between the two tests was statistically significant ($p = 0.03$). The agility test was 16.15 ± 0.60 s in the initial test and 15.85 ± 0.52 in the final test. The mean difference between the two tests was statistically significant ($p = 0.00$). The tests targeting explosive strength of the lower limbs also identified a significant impact of the programs applied over the 5 months, the difference in means being statistically significant.

Strength training increases muscle fiber thickness. For general muscle training relatively fast movements are recommended, with resistance or loads chosen according to age.

Force determines the speed of execution of movements in basketball, being the motor quality that is most easily gained, but also easily lost. Analytical strength can be developed using the repeated efforts method by employing in each exercise 20–25 repetitions in a series, with 2-3 sets (alternating different muscle groups) performed as a circuit, with a pause between repetitions and between circuits. Within strength training, it is intensive training that improves the synchronization of motor units and appears to be the most effective form of specific strength development consisting of rapid contractions using different loads. Strength training in children and juniors targets 2 main directions: analytical development of the strength of different muscle groups, explosive strength development. The methods used in particular for explosive strength development are the combined method, the plyometric method and the game-based method. In juniors, plyometrics used 2-3 times in weekly training will allow to transform slow fibers into fast fibers fast fibers. The combined method consists of combining different contraction regimes in the same training session. Thus, a "combined" circuit may include isometrics, isotonic contractions, jumping and sprinting. In relation to the motor action in which it acts, force can manifest itself in several forms.

Conclusions

The analysis of the results obtained as a result of applying the training program allowed us to find that between the 2 tests there are no significant differences in all tests applied to evaluate physical fitness.

In this sense, we exemplify:

- the efficient nature of the experimental program is also demonstrated in terms of statistical indices that reflect the level of specific physical fitness tests. Comparing the data for the 20 m sprint test, a better improvement of the group average in the second test can be observed compared to the average values obtained by the group in the first test. We can say that, at the end of the experiment, short-distance sprinting improved as a result of implementing the general and specific physical fitness program developed by us, the average time being superior to that from the initial test.
- from the analysis and comparison of the results obtained by basketball players following the two tests obtained in the jump test (vertical jump), it is noted that the group improved their explosive strength, compared to the initial testing, but not enough to reach the FRB threshold.
- regarding the agility testing by the adapted T-Test, which is characterized by the execution of the movement in conditions of execution speed, rapidity, precision, coordination, the group improved its time from one test to the other, which demonstrates the efficiency of the means used to improve speed in coordination mode.
- the results of the aerobic endurance and maximum oxygen consumption testing had the most significant improvement, which confirms that the implemented training program was well thought out.

Following the results obtained and their analysis, we found that the level of physical training increased homogeneously, which is why the hypothesis is confirmed that the improvement in testing results also led to exceeding last year's performance, namely winning the gold medal at the end of the U15 Women's National Basketball Championship.

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