Methodology for developing physical fitness of female basketball players

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Abstract

Purpose: The aim of the study is to examine and analyze the physical fitness of female student basketball players by conducting a questionnaire survey on improving physical fitness in annual training sessions.

Methods: Analysis of scientific and methodological liter ature, pedagogical tools, pedagogical observation, mathe matical and statistical analysis.

Results: At the end of the study, the criteria for special physical training requirements in the zigzag dribbling and shooting test for 12 female basketball players showed 5.3±1 times in the experimental group and 6.2±1 times in the control group. The statistical difference was t=3.4; P<0.01, indicating significant improvements between the results of the experimental and control groups.

Conlcusion: In the basketball shooting test, the experimental group averaged 4.6±1 times and the control group 4.7±3 times, with a statistical difference of t=2.3; P<0.05. Reliable indicators between the results of the experimental and control groups were proven using mathematical statistical methods. In the 3x10 m shuttle run test, the experimental group averaged 9.2±0.9 seconds, while the control group averaged 9.5±0.8 seconds, with statistical differences of t=2.8; P<0.05, proving that the differences between the results of the experimental and control groups were significant.

Analysis of the obtained results demonstrates that the application of these training materials in the preparation process of female student basketball players is an effective pedagogical approach and holds significance due to its reliability.

Keywords: Training sessions, competition period, functional preparation, physical preparation, technical-tactical preparation, psychological preparation, factor, means, method, analysis.

Introduction

One of the main reasons is that factors influencing the development of physical fitness in female student basketball players during annual training sessions and its maintenance during competition periods are hardly taken into account [1, 6].

Studying and analyzing the factors affecting the physical fitness of female student basketball players serves to create extensive opportunities for athletes to maximally demonstrate the level of preparedness achieved in competitive cycles and maintain stable physical fitness. In the process of studying and analyzing scientific and methodological literature related to the research topic, it was determined that information on the physical fitness of female student basketball players is presented in a general manner [2, 7].

When female student basketball players have high physical fitness, they can demonstrate higher quality physical, technical, and tactical performance in their activities [4]. As a result of studying and analyzing the factors influencing the physical fitness of female student basketball players during the annual training process, it is necessary to systematically structure these factors, develop effective ways to mitigate their negative aspects, and apply them in training sessions [3, 5].

Results and discussion

Improving the physical fitness of female basketball student-athletes during annual training sessions plays a crucial role in achieving high sports results. The duration and structure of training are determined by many factors. The main components include the special characteristics of the sport, the fundamental principles of sports mastery, the athlete's individual adaptation capabilities, the structure of training, and the content of the conducted training sessions.

To enhance the general and special physical fitness of female basketball players, a block of exercises focused on developing the key physical qualities of speed, agility, and speed-strength was applied in a multidisciplinary, differentiated manner (such as gradual mastery from simple to complex). This approach resulted in increased indicators of maintaining stable game intensity and improved performance in the final stages of matches.

Based on the objective of this study, a pedagogical experiment was conducted to substantiate the effectiveness of our methodology, which aimed to implement

Table 1. Statistical analysis of physical fitness indicators of female basketball players at the beginning of the pedagogical study (n=24)

No.	Control tests	Experimental group (n=12)	Control group (n=12)	t	P
		($\bar{X}$ ±σ)	($\bar{X}$ ±σ)		
GPT	60 m sprint (sec.)	10.2±0.7	10.1±0.6	1.3	>0.05
GPT	Throwing a 500g grenade (m)	16±4	15±5	1.2	>0.05
GPT	Push-ups while leaning on the floor (times)	6±2	6±2	1.5	>0.05
SPT	Zig-zag dribbling and shooting (times)	2±1	2±1	1.4	>0.05
SPT	Basketball shooting (times)	3.4±2	3.6±2	0.9	>0.05
	3x10m shuttle run (seconds)	9.8±0.9	9.7±0.8	0.5	>0.05

differentiated exercises for improving the physical fitness of female basketball players in the training process.

The pedagogical research was conducted during the training process of female basketball players. The participants of the study (n=24) were divided into two groups: the experimental group ("EG") and the control group ("CG"). The number of girls in both groups was equal (n=12). The training sessions of the control group basketball players were conducted traditionally without any changes, while in the experimental group, the sessions were conducted according to the methodology we developed.

Initially, using established criteria, we determined the level of physical fitness of the female basketball players. Then, taking into account the fitness level of each group, training sessions were conducted using the methods we developed.

For a comprehensive assessment of the physical fitness of female basketball players, we used the following control tests: 60m sprint, 3x10m shuttle run, and push-ups. To assess the special physical preparedness of the girls, the following control tests were used: zigzag dribbling and shooting (number of successful attempts), basketball shooting (number of successful attempts), and 3x10m shuttle run (seconds).

According to the criteria of normative requirements for physical fitness, at the beginning of the study, in the 60m sprint test for 12 female basketball players, the experimental group showed 10.2±0.7 seconds, while the control group showed 10.1±0.6 seconds. The statistical difference was t=1.3; P>0.05. No significant differences were observed between the results of the experimental and control groups.

In the 500g grenade throw (m) test, the criteria of normative requirements for physical fitness at the beginning of the study showed 16±4 m for the experimental group of 12 female basketball players and 15±5 m for the control group. The statistical difference was t=1.2; P>0.05. The statistical differences between the results of the experimental and control groups were not significant.

In our study involving 12 female basketball players, the push-up test (number of repetitions) showed 6±2 repetitions in both the experimental and control groups, with statistical differences of t=1.5; P>0.05. No significant differences were observed between the results of the experimental and control groups. The studies indicate that at the beginning of our experiment, no significant differences were observed in the general physical fitness of the female basketball players. Regarding the criteria for special physical fitness requirements of our female players, at the start of the study, the test of dribbling and shooting using the zig-zag method (number of successful attempts) showed 2±1 times in both the experimental and control groups, with statistical differences of t=0.9; P>0.05, which is not statistically significant. The next indicator, the basketball shooting test (number of successful attempts), showed 3.4±2 times in the experimental group and 3.6±2 times in the control group, with statistical differences of t=0.5; P>0.05. The subsequent indicator, the 3x10 m shuttle run test (in seconds), showed 9.8±0.9 seconds in the experimental group and 9.7±0.8 seconds in the control group, with statistical differences of

Table 2. Block of exercises aimed at improving the special physical training of female basketball student-athletes.

N	Exercise technique	Number of repetitions	Rest interval	Organizational and Methodological Guidelines
	BLOCK FOR DEVELOPING THE GENERAL PHYSICAL TRAINING BASE			
1.	Running in place (at speed) - body upright, feet shoulder-width apart, alternately lifting knees while running without moving from the spot.	30-45 seconds	30 seconds	Keep the body upright, arms actively moving
2.	Plank position with elbows on the floor - Elbows on the floor, directly under the shoulders, forearms facing straight forward. Legs should be slightly apart (hip-width), resting on the toes.	3 sets × 30 seconds	30-60 seconds	Keep abdominal muscles tense
3.	Jump squats - feet shoulder-width apart, arms at the sides or in front of the chest (for balance). Quickly straighten the knees and forcefully jump upwards. Feet shoulder width apart	3 sets × 10-12 repetitions	45 seconds	Land softly, keep knees slightly bent
4.	Dribbling - body slightly bent forward, knees slightly bent, eyes focused on the ball and forward.	3 sets × 20-30 meters	60 seconds	Head up, maintain ball control
5.	Start-stop running - one of the important exercises that develops the athlete's ability to control movement speed, stop abruptly, and quickly resume movement.	4-6 times × 10-15 meters	45 seconds	Start powerfully, stop abruptly
	FUNCTIONAL TRAINING BASE EXPANSION UNIT			
1.	Side running - lower body position (as if squatting), hips pulled back. Knees bent, shoulders relaxed, arms in ready position. Body slightly tilted forward, head held high, eyes directed forward.	4×15-20 meters	30 seconds	Speed in lateral movements

Continuation of Table 2.

2.	**High knee running in place- body upright, shoulders relaxed. Feet shoulder-width apart, arms bent at the elbow at approximately 90°, close to the body.**	**3×30 seconds**	**30 seconds**	**Quick stopping, turning, jumping, and decision-making.**
3.	Jumping alternating legs - one leg in front, the other behind (as if ready to run). Knees slightly bent. Arms parallel to the body, in ready position.	3×10 times (per leg)	45 seconds	Keep the back straight, maintain proper body posture, and ensure equal distance between legs throughout the movement.
4.	Lying on back with a basketball, bending and extending the body forward	3×15 times	30 seconds	Focus on proper breathing, maintaining body position, and quality of movement.
5.	Side rotations with a basketball	3×20 (10 to each side)	30 seconds	Preparation for lateral muscle engagement and body rotation
	BLOCK FOR DEVELOPING SPECIALIZED PHYSICAL TRAINING BASE			
	Goal: Improve the level of specialized physical fitness of female basketball players by developing their speed, strength, endurance, balance, coordination, and jumping abilities.			
	Exercises for developing speed			
1.	Short-distance sprint (10-20 m) - Explosive start, body leaning forward	5-6 repetitions	30-40 seconds rest after each sprint	In the starting position, the body is leaning forward. The front foot is on the line, the back foot slightly behind and bent.
2.	"Zig-zag" running - running sideways between 5-6 obstacles.	4-5 repetitions	1 minute rest	Perform as quickly as possible.

t=0.5; P>0.05. No significant differences were observed between the results of the experimental and control groups. Based on these test results, educational materials were developed and incorporated into the training process to improve the physical fitness of the female basketball players.(See Figure 1 and Table 1).

The components of the mechanism for implementing the exercise block aimed at improving the general and specialized physical fitness of female basketball student-athletes include:

General physical training is divided into the following components:

Forming the foundation of physical training - includes tasks such as standard repetition of movements and repetition of movements at various speeds.

Developing specialized physical qualities

Continuation of Table 2.

3.	**Reaction exercise (running on signal)**	**8-10 repetitions**	**20-30 seconds rest after each signal**	**Run when the coach gives the signal**
		DEVELOPING JUMPING ABILITY		
1.	Vertical jump (with both feet)	3 sets, 10 repetitions each	1 minute rest after each set	Jump with arm power
2.	Step jumps (onto a bench)	3 sets, 8-10 repetitions each	1-1.5 minutes rest	Alternate legs when performing
3.	Running jump (close to the hoop)	4 sets, 6-8 repetitions	1 minute rest	Continuous running jumps
		STRENGTH EXERCISES (FOR OVERALL BODY STRENGTHENING)		
1.	Plank (static hold)	3 times, 30-45 seconds each	30 seconds rest	Body straight, abdomen tightened
2.	Push-ups	3 sets, 10-12 repetitions	1 minute rest	Bend elbows back, don't fully extend
3.	Abdominal crunches	3 sets, 15-20 repetitions	1 minute rest	Lift shoulders without touching the floor

- includes tasks of developing basic physical qualities and combined physical qualities.

Enhancing functional capabilities that ensure physical fitness - includes tasks of increasing the capabilities of the respiratory system (RS) and the cardiovascular system (CVS).

Full demonstration of general physical preparedness - includes tasks of performing simple movements and complex movements.

Special physical training is divided into the following components:

Forming the foundation of special physical training - includes tasks of performing movements in parts and performing movements as a whole.

Improving specialized motor training - includes exercises with the ball and exercises without the ball.

Directing the special physical training foundation towards improving technical preparedness - involves working in standard situations and non-standard situations.

Full demonstration of special physical training - includes exercises performed individually and exercises performed with a partner.

As a result of this mechanism, we can say that if the training process is organized based on a model of applying a block of exercises aimed at improving the general and specialized physical preparation of female basketball players, it will enable them to perform shots of varying complexity, execute reliable and accurate technical-tactical actions in complex situations arising during training and competitions, and effectively conclude matches.

Table 3. Statistical analysis of physical fitness indicators of female basketball players at the end of the pedagogical study (n=24)

No.	**Control tests**	**Experimental group (n=12)**	**Control group (n=12)**	**t**	**P**
		$\bar{X}$ (±σ)	$\bar{X}$ (±σ)		
GPT	60 m sprint (sec)	9.2±0.5	9.7±0.4	2.5	<0.05
	500g grenade throw (m)	19.4±3	19.8±4	2.3	<0.05
	Push-ups (times)	8.6±2	9.1±2	2.4	<0.05
SPT	Zigzag dribbling and basket throw (times)	5.3±1	6.2±3	2.2	<0.05
	Basketball free throw (times)	4.6±1	4.7±3	2.3	<0.05
	3x10m shuttle run (sec)	9.2±0.9	9.5±0.8	2.8	<0.05

At the end of the study, the criteria for regulatory requirements in physical fitness were as follows: In the 60 m running test (seconds), 12 female basketball players in the experimental group showed results of 9.2±0.5 s, while the control group showed 9.7±0.4 s. The statistical differences at the end of the study were t=2.3; P<0.05, indicating significant differences between the results of the experimental and control groups. In the 500 g

grenade throwing test (m), the experimental group achieved 19.4±3 m, while the control group reached 19.8±4 m, with statistical differences of t=2.4; P<0.05, showing significant increases in the differences between the experimental and control group results. In the push-up test (times), the experimental group performed 8.6±2 repetitions, while the control group did 9.1±2 repetitions, with t=2.4; P<0.05, indicating significant increases in the differences between the experimental and control group results.

The studies have shown that at the end of our experiment, mathematical and statistical methods confirmed significant increases in the differences in general physical fitness of female basketball players.

Conclusion

During the study and analysis of scientific and methodological literature, it was revealed that scientists have not conducted separate research on factors affecting the maintenance of physical fitness stability in female student basketball players during the competition period of annual training sessions.

When analyzing the results obtained from the study using mathematical-statistical methods, it was confirmed that conducting training sessions by studying and analyzing factors affecting the stability of physical fitness of female student basketball players during the competition period of annual training is an effective approach to preventing and eliminating the negative impact of these factors. This was validated through the results of the conducted training sessions. When studying and analyzing the factors influencing the stability of physical fitness of female student basketball players during the competition period of annual training, taking into account the specifics of the sport and the individual capabilities of the athletes serves to achieve high sports results.

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