

STRENGTH AND QUALITY TRAINING OF BASKETBALL PLAYERS



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FORÇA E TREINAMENTO DE QUALIDADE DOS JOGADORES DE BASQUETEBOL

FUERZA Y ENTRENAMIENTO DE CALIDAD DE LOS JUGADORES DE BALONCESTO

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ABSTRACT

Introduction: Quality exercise training of young people is a fundamental basic requirement for developing physical fitness in college basketball teaching. **Objective:** Enhance exercise training in young basketball players. **Methods:** A random selection of 50 student volunteers was made for this research. The strength and quality of basketball players of different ages were analyzed. The experimental group was subjected to specific strength training, while the control group was subjected to routine physical exercises. The experiment period was 12 weeks, and the specific technical indicators of the athletes were collected before and after the end of the experiment. The collected data were statistically treated and discussed in light of the scientific literature. **Results:** No significant difference was found between the two groups in the initial test score ($P>0.05$). The experimental group's performance in exercise was better than the control group after 12 weeks ($P<0.01$). The experimental group demonstrated better performance than the control group in the standing jump, 15-meter reentry, and forward jump, corroborating the significantly different data between the two groups ($P<0.01$). **Conclusion:** This study aimed to study the unique role of strength training in the physical training of young basketball players. Special strength training positively affects upper limb muscle training in young basketball players. The lower extremities of basketball players showed expressive functional gains with special strength training. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Adolescent; Basketball; Athletes; Resistance Training.

RESUMO

Introdução: O exercício físico de qualidade dos jovens é requisito básico fundamental para o desenvolvimento da aptidão física no ensino do basquetebol universitário. **Objetivo:** Fortalecer o treinamento do exercício físico em jovens jogadores de basquetebol. **Métodos:** Efetuou-se a seleção aleatória de 50 estudantes voluntários para a pesquisa. Foi analisada a força e a qualidade dos jogadores de basquetebol em diferentes idades. O grupo experimental foi submetido a um treinamento de força específica, enquanto o grupo de controle foi submetido a exercícios físicos de rotina. O período do experimento foi de 12 semanas e os indicadores técnicos específicos dos atletas foram coletados antes e após a finalização do experimento. Os dados coletados foram tratados estatisticamente e discutidos à luz da literatura científica. **Resultados:** Não foi encontrada diferença significativa entre os dois grupos na pontuação inicial do teste ($P>0,05$). O desempenho do grupo experimental no exercício foi melhor que o do grupo de controle após as 12 semanas ($P<0,01$). O grupo experimental demonstrou um desempenho melhor que o do grupo controle no salto em pé, reentrada de 15 metros, e salto de frente, corroborando com os dados significativamente distintos entre os dois grupos ($P<0,01$). **Conclusão:** Este estudo teve como objetivo estudar o papel único do treinamento de força no treinamento físico dos jovens jogadores de basquetebol. O treinamento especial de força afeta positivamente o treinamento muscular dos membros superiores nos jovens jogadores de basquetebol. As extremidades inferiores dos jogadores de basquetebol evidenciaram ganhos funcionais expressivos com o treinamento especial de força. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Adolescente; Basquetebol; Atletas; Treinamento de Força.

RESUMEN

Introducción: El ejercicio físico de calidad de los jóvenes es un requisito básico fundamental para el desarrollo de la aptitud física en la enseñanza del baloncesto universitario. **Objetivo:** Reforzar el entrenamiento del ejercicio físico en jóvenes jugadores de baloncesto. **Métodos:** Se realizó una selección aleatoria de 50 estudiantes voluntarios para la investigación. Se analizó la fuerza y la calidad de los jugadores de baloncesto a diferentes edades. El grupo experimental fue sometido a un entrenamiento de fuerza específico, mientras que el grupo de control fue sometido a ejercicios físicos rutinarios. El periodo del experimento fue de 12 semanas y se recogieron los indicadores técnicos específicos de los atletas antes y después de finalizar el experimento. Los datos recogidos fueron tratados estadísticamente y discutidos a la luz de la literatura científica. **Resultados:** No se encontraron diferencias significativas entre los dos grupos en la puntuación de la prueba inicial ($P>0,05$). El rendimiento del grupo experimental en el ejercicio fue mejor que el del grupo de control después de 12 semanas ($P<0,01$). El grupo experimental mostró un mejor rendimiento que el grupo de control en el salto



de pie, el reingreso de 15 metros y el salto frontal, corroborando los datos significativamente diferentes entre los dos grupos ($P < 0,01$). Conclusión: Este estudio tenía como objetivo estudiar el papel único del entrenamiento de la fuerza en la preparación física de los jóvenes jugadores de baloncesto. El entrenamiento de fuerza especial afecta positivamente al entrenamiento muscular de las extremidades superiores en jóvenes jugadores de baloncesto. Las extremidades inferiores de los jugadores de baloncesto mostraron ganancias funcionales expresivas con el entrenamiento de fuerza especial.

Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.

Descriptores: Adolescente; Baloncesto; Atleta; Entrenamiento de Fuerza.

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INTRODUCTION

Adolescence is a very critical time for basketball players. Scientific physical exercise for teenagers shows that not only technical and technical training should be carried out in adolescence, but also the characteristics of psychological and physical development should be well grasped. It is indispensable to strengthen the strength training of basketball players in basketball teaching at this stage. Currently, most domestic youth basketball teams still lack scientific, systematic and standardized training in terms of training plan, training method, training intensity, and load.¹ Many coaches practice based on their own experience. Not only will it not be able to achieve the best exercise for a long time, but it will lead to some physical sports injuries. Through practical teaching, we can see that although some players have significantly improved their skills in hard practice, their physical fitness has not been significantly improved. Especially in competitions, improving physical fitness through many high-intensity exercises is challenging. This shows that ordinary physical fitness is difficult to improve their expertise effectively. Two years of high-intensity training can significantly improve the jumping height index of the national women's basketball players. Still, the performance of the national male basketball teams is not very good. Existing surveys have shown that strengthening core strength exercises in volleyball, basketball, football, and other projects can significantly improve their airborne, coordination, and explosive abilities. In this paper, a systematic study is carried out from the strength and quality training perspective utilizing literature review, expert interviews, and experimental methods. The research results of this paper can provide some reference for the domestic youth basketball training work.

METHOD

Research objects

The research target of this dissertation is first-year college students. We divided 50 students into two groups.² There were 25 cases in the experimental and 25 in the control groups. There were no significant differences in the subjects' height, age, and physical fitness.

Investigation method

Test

Before the official test, this article will conduct a one-week training for the trainees. In this trial, athletes were given basic training in the physical education curriculum.³ At the same time, the coaches are on the side to guide and answer various questions. Basketball players will do some cardio before the official exam. At the same time, athletes adjust their physical fitness to the best test level. Under the guidance of the coaches, the author will make accurate measurements of the test results.

Test

This course is tested on a freshman basis in the second half of the 2021-2022 school year. The control group studied basketball courses following the conventional teaching methods and curriculum arrangements. The experimental class adopts two 90-minute exercise courses.⁴ Athletes

perform 25-30 minutes of physical exercise, and the rest of the time, athletes perform strength training according to the schedule. Functional strength training is performed in a cycle sequence. Each workout was 4 minutes apart for 15 weeks of workouts. The details are shown in Table 1:

Table 1. Strength and conditioning training exercise program.

Action	Number of groups	Frequency
Push up	2	40
Side braces (both sides)	2	15
Back up	2	40
Full Squat + Front Medicine Ball Raise	2	10
Crunches + Medicine Ball Front Toss	2	15
Belly jump	2	10
One-leg kneeling medicine ball chest toss	2	10
Front lunge vertical jump	2	10

The method of distance tracking for basketball captains

This paper establishes a parametric fusion tracking control mode for long-distance pitching trajectory planning based on parameters.⁵ This paper combines it with the controlled parameters of long-distance pitching for long-distance data integration and characterization. In this way, this paper derives the motion pattern of long-distance projection:

$$E = \left\{ \frac{\alpha(x) + \beta(x)}{\alpha(x) - \beta(x)} \mid \theta(x) \mid \frac{p(\alpha(x) - \beta(x))}{\alpha(x) + \beta(x)} \right\} \quad (1)$$

E is the motion function of long-range shooting. $\alpha(x)$ is the initial action rate. $\beta(x)$ is the time delay of sampling. $\theta(x)$ is the ambient environment error. p is the allocation dimension of the space. In this paper, a basketball is tracked and modeled over long distances using dynamic perception sensors.⁶ In this paper, the measurement results of the system are obtained by modeling it.

$$j_{\varepsilon} = \sqrt{\frac{(\omega + \phi)^3}{g}} \quad (2)$$

j represents a series of perceptual data. ε represents the assigned matrix. ω is the shooting angle. ϕ is dynamic change. g represents the quantitative properties of the motion trajectories of long-distance basketball. So the distribution of mechanical inertia is:

$$s = \theta(x) + (\omega + \phi) \quad (3)$$

In the formula: s represents the distribution of mechanical inertia. This paper analyzes the fuzzy state parameters of basketball players' long-distance shooting trajectory. In this way, the distribution law $l = -1, 0, 1, \dots, n$ of the motion parameters of long-distance shooting is obtained.⁷ This paper combines it with piecewise sorting and uses this eigenvector to

compute it numerically. In this way, this paper draws the basic conclusions of the method:

$$R = \eta \frac{\theta(x)}{s} + \frac{(\omega + \phi)^l}{\Delta k} \quad (4)$$

R represents the synthesis of dynamic information of long-distance basketball projection. Δk is the output of a gradient. η is the length of the trajectory distribution sequence. In this paper, fuzzy identification technology is used to construct the trajectory characteristic model of long-distance basketball projection.

$$T = R(i) + \frac{(y \times 2n)^l}{\Delta k} \quad (5)$$

T represents the observed deviation value. i Observation error sequence results representing the long-distance tracking of basketballs. i stands for the wrong interfering factor. y and n refer to the relative distribution and moment of inertia of the basketball captain's distance shot.

Mathematical Statistics

In this paper, a single-sample t-test was performed using SPSS 19.0 software. In this paper, the variation of each correlation index between the experimental group and the control group was statistically analyzed.⁸ The significance level is $P=0.05$.

Ethical Compliance

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Hainan Vocational University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

This article ensures that students are of the equal physique when divided into groups.⁹ There was no significant difference in their body mass index before the trial. Tables 2 and 3 give the results after the test.

The results showed no significant difference between the experimental and control groups in the initial test scores. In contrast, the control group was slightly higher in all scores ($P>0.05$). After 12 weeks of exercise, the exercise performance of the experimental group was better than that of the control group, and there was a significant difference between the two groups ($P<0.01$). After the test, the experimental group performed better than the control in the standing long jump, 15-meter reentry, and long jump. The data between the two groups were significantly different ($P<0.01$). Objective: To explore the effect of the particular ability training method on young basketball players' upper limb muscle training.¹⁰ In lower extremity muscle training, athletes' leg muscle training has achieved noticeable results, but their effects have apparent differences.

Table 2. Comparison of physical fitness between the two groups of male subjects before and after the test.

Group	In experiment		Difference mean
	Before experiment	After the experiment	
Stage			
Sit-ups	21.71±6.19	30.1±5.52	7.92
Push-ups	5.43±2.57	9.71±4.38	4.05
Standing long jump	1.77±0.11	1.93±0.18	0.153
15m back run	7.24±0.57	7.05±0.57	-0.18
sit and push	2.71±0.75	3.25±0.69	0.504
Sitting forward bend	9.14±4	10.86±4.86	1.62
Group	Control group		Difference mean
Stage	Before experiment	After the experiment	
Sit-ups	21.81±4.95	22.19±2.95	0.38
push ups	5.33±2.95	5.05±2.48	-0.285
Standing long jump	1.79±0.3	1.82±0.26	0.0285
15m back run	7.14±0.76	7.05±0.86	-0.095
sit and push	2.77±0.82	2.8±0.5	0.0285
Sitting forward bend	9.24±3.62	9.05±2.57	0.19

Table 3. Comparison of physical fitness between the two groups of girls before and after the experiment.

Group	In experiment		Difference mean
	Before experiment	After the experiment	
Stage			
Sit-ups	16.1±5.24	22.19±3.52	5.13
Push-ups	1.05±0.67	2.19±0.67	1.14
Standing long jump	1.33±0.06	1.43±0.07	0.095
15m back run	8.19±0.67	8±0.67	-0.19
Sit and push	1.63±0.3	1.85±0.25	0.2185
Sitting forward bend	10.76±5.33	13.43±4.86	2.66
Group	Control group		Difference mean
Stage	Before experiment	After the experiment	
Sit-ups	16.29±4.1	16.86±2.95	0.57
push ups	1.05±0.57	1.24±2.48	0.19
Standing long jump	1.34±0.1	1.36±0.26	0.019
15m back run	8.1±0.76	8.1±0.86	0
Sit and push	1.61±0.36	1.63±0.5	0.019
Sitting forward bend	10.57±4.95	10.86±2.57	0.285

DISCUSSION

This paper summarizes the role of strength and quality training in youth basketball teams by analyzing the training goals and training content.

The first step is basic skills. This stage can be seen as a “physically active period.” The goal is to “activate” the body of the young player’s torso muscles to set the stage for the next training session.¹¹ The second is to think of it as an exercise process. Its main goal is to allow young players to exercise their strength and gradually become familiar with and master their exercise methods. Various types of static training dominate this period at the balance point, and the training methods are mainly based on various types of empty-hand training. For example: include lying on the opposite side, raising the hand and raising the leg, lying on the prone leg, straightening the hip, lying on the side with the arm straightening the hip, raising the leg, etc.

The second level is advanced. Compared to the previous session, this session is much more complex, and the training load is much higher. Athletes will also need to use training equipment such as Swiss balls, kettlebells, and resistance bands. The focus of this period is on performing several different exercises in an unstable state. In the early days of the junior basketball team, a series of static exercises can be used to train their core muscles and neuromuscular control. Athletes can engage their core muscles more as they enter Phase 2. Increase their sense of control and balance at this stage. This period can also be considered an “advanced stage.” The exercises during this period are prone to arm with toes in

contact with the ball, resistance band hip extension, and supine legs to push the Swiss ball forward.

The third period is the stabilization period. This session aims to strengthen the exercise of core strength. This training phase aims to promote the trunk perception and muscle strength of the core muscles. Increase its control over the nervous system. Athletes need to focus on multi-directional and multi-angle exercises to ensure the best state of youth basketball. During this period, you can exercise flat hip lift, single prone foot, Swiss ball, Swiss ball foot lift, etc.

CONCLUSION

Systematic, scientific, and targeted functional strength training can improve young basketball players’ muscular activity, physical flexibility, upper and lower limb strength, explosive power, abdominal strength, speed, and flexibility. The traditional concept of basketball teaching and training in China believes that young athletes should not perform an excessive physical exercise to avoid sports injuries. However, due to the excellent work of coaching and supervision, there were almost no significant sports injuries, indicating that functional strength training is more in line with the physical training of young basketball players.

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AUTHORS’ CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. Yeqi Su: writing; Qingyun Zhong: data analysis; Min Liu: article review and intellectual concept of the article.

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