STRENGTH TRAINING INFLUENCES ON BASKETBALL PLAYERS

RESISTÊNCIA FÍSICA EM JOGADORES DE BASQUETE SOB TREINAMENTO DE FORÇA

RESISTENCIA FÍSICA EN JUGADORES DE BALONCESTO BAJO ENTRENAMIENTO DE FUERZA

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ABSTRACT

Introduction: Besides excellent sports skills, basketball players must also have a strong cardiopulmonary capacity and sports endurance to maintain good physical strength throughout the game. Objective: Study the effect of strength training on basketball players' cardiorespiratory capacity and exercise endurance. Methods: Throughout the experiment, the athletes in the experimental group performed strength training, including special training to hold the ball, special training without the ball, and comprehensive training. The training methods used in the control group were traditional basic track and field-based strength training, dumbbell, single and parallel bars, etc. The experiment lasted six weeks, and one hour of physical training was performed every Tuesday, Thursday, and Saturday. Results: Compared to traditional training methods, the training methods proposed in this paper improved the athletes' cardiopulmonary capacity and sports endurance. The experimental group had improved dribble jump shot, two minutes continuous shot, T-shaped run, three laps back with variable distance, and comprehensive performance. Conclusion: This scheme can improve athletes' cardiopulmonary capacity and routine and basketball-related sports endurance to improve athletes' competitive level. ***Level of evidence II; Therapeutic studies - investigating treatment outcomes.***

Keywords: Basketball; Resistance Training; Physical Endurance.

RESUMO

Introdução: Além de excelentes habilidades esportivas, os jogadores de basquetebol também precisam ter forte capacidade cardiopulmonar para manter uma resistência física ótima durante todo o jogo. Objetivo: Estudar o efeito do treinamento de força sobre a capacidade cardiorrespiratória e a resistência física sob o exercício de treinamento de força nos jogadores de basquetebol. Métodos: 20 atletas do segundo ano de educação física foram aleatoriamente selecionados como voluntários e igualmente divididos em grupo controle e experimental. Durante o experimento, os atletas do grupo experimental realizaram o treinamento convencional, dirigido para ambos grupos, seguido de um protocolo com treinamento específico de força. O experimento durou seis semanas, onde uma hora de treinamento físico era realizada todas as terças, quintas e sábados. Resultados: Em comparação com os métodos tradicionais, os métodos de treinamento adicionais neste trabalho melhoraram a capacidade cardiopulmonar e a resistência física dos atletas. O grupo experimental melhorou o tiro de salto, o tiro contínuo de dois minutos, corrida em forma de T, as três voltas para trás com distância variável e o desempenho integral. Conclusão: O protocolo apresentado pode melhorar a capacidade cardiopulmonar dos atletas, melhorar a resistência física basal e a resistência esportiva relacionada ao basquete, promovendo a elevação do nível atlético. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Basquetebol; Treinamento de Força; Resistência Física.*

RESUMEN

Introducción: Además de una excelente capacidad deportiva, los jugadores de baloncesto también deben tener una fuerte capacidad cardiopulmonar y resistencia deportiva para mantener una buena fuerza física durante todo el partido. Objetivo: Estudiar el efecto del entrenamiento de fuerza sobre la capacidad cardiorrespiratoria y la resistencia al ejercicio de los jugadores de baloncesto. Métodos: A lo largo del experimento, los atletas del grupo experimental realizaron un entrenamiento de fuerza, que incluía un entrenamiento especial para sujetar el balón, un entrenamiento especial sin balón y un entrenamiento integral. Los métodos de entrenamiento utilizados en el grupo de control fueron el tradicional entrenamiento de fuerza básico basado en el atletismo, con mancuernas, barras simples y paralelas, etc. El experimento duró seis semanas y se realizó una hora de entrenamiento físico cada martes, jueves y sábado. Resultados: En comparación con los métodos de entrenamiento tradicionales, los métodos de entrenamiento propuestos en este trabajo mejoraron la capacidad cardiopulmonar y la resistencia deportiva de los atletas. El grupo experimental mejoró el tiro en salto, el tiro continuo de dos minutos, la carrera en forma de T, las tres vueltas atrás con distancia variable y el rendimiento integral. Conclusión: Este esquema puede mejorar la capacidad cardiopulmonar de los atletas, mejorar la resistencia deportiva rutinaria y la resistencia deportiva relacionada con el baloncesto, a fin de promover la mejora del nivel competitivo de los atletas. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

***Descriptores*:** Baloncesto; Entrenamiento de Fuerza; Resistencia Física.

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INTRODUCTION

Basketball is a competitive sports event that requires the overall quality of athletes. In the process of sports, basketball players are required to have enough strength to participate in physical confrontation in sports.[1] At the same time, we also need enough physical strength to support the use of technical movements. Moreover, the modern basketball project emphasizes team cooperation in the development process. Athletes are required to have sufficient sense of teamwork. Understand the coach's tactical intention and complete the game through the use of various tactics. Because the basketball court has a certain space.[2] Therefore, it is inevitable for athletes to participate in some fast break links during the competition. The frequent use of fast attack tactics not only puts forward requirements for the explosive power of athletes, but also tests the athletes' Sports endurance. In many basketball matches, it is easy to find that after a certain period of time.[3] The attacking efficiency of the athletes is decreasing as a whole. The decline of this trend of excellent basketball players is much lower than that of ordinary players. Although the popularity and related development of basketball in China have reached a certain scale.[4] However, the overall level and achievements of Chinese basketball are far from enough. There is still a gap between the project training system and the talent training system and the basketball power. In the international competition, the most intuitive feeling is that there is a gap between the physical strength and endurance of the players and the basketball power, which ultimately leads to a gap in performance.[5] Therefore, we need to conduct in-depth research in the training process. How to improve the physical function and sports endurance of Chinese basketball players through training. The final goal is to improve the performance, and strengthen the improvement in the training link. Improving the comprehensive quality of basketball players is the basis of improving the level of basketball sports.[6] Therefore, this paper discusses the influence of strength training on the cardiorespiratory ability and sports endurance of basketball players, so as to scientifically help coaches formulate strength training strategies for athletes.[7]

METHOD

In this paper, the basketball athletes of the second year Physical Education College of a university were selected as the research objects to carry out relevant experiments in the spring semester. After inclusion and exclusion, 20 athletes were finally selected as the study subjects. The study and all the participants were reviewed and approved by Ethics Committee of Shandong University Of Finance And Economics (NO.18SDUFE29-SA). Their age, height and weight are shown in Table 1.

Before the formal experiment, the author first conducted a pre experiment. Through the two-week preliminary training on the experimental training scheme by the athletes' representatives, their opinions on the experimental duration, exercise load, exercise intensity and exercise frequency were consulted, and the designed exercise mode was adjusted to obtain the final training scheme.

During the whole experimental process, the athletes in the experimental group carried out strength training in three aspects, including special training with the ball, special training without the ball and comprehensive training. The training method adopted by the control group was the traditional basic strength training based on track and field, dumbbell and single and parallel bars. The experiment lasted for six weeks, and one hour of physical training was carried out every Tuesday, Thursday and Saturday. Corresponding stretching and relaxation training shall be added before and after the start of sports to reduce the injury caused by sports training. The experimental group and the control group should strictly abide by the experimental regulations, keep the life rhythm and exercise frequency as consistent as possible, and keep the training intensity and training time consistent except for the different training contents of the experiment, so as to minimize the impact of unrelated variables on the experimental results.

In the process of sports training, the cardiorespiratory strength and 1-kilometer running performance of the athletes were measured every two weeks, and the related pictures were drawn with Excel software to analyze the impact of sports training on the cardiorespiratory endurance and sports endurance of the athletes. Before and after the sports training, the basketball endurance indexes such as the players' dribble jump shot, two minute continuous shooting, T-shaped running, three times of turn back running with variable distance in the whole field and comprehensive test were tested. The relevant indexes were collected, and the data were processed with the SPSS software, and the existence of the significant difference was analyzed.

Table 1. Basic information of experimental group and control group.

Group	Age (years)	Height (CM)	Body weight (kg)	BMI(kg/m^2)	Training years (years)
Control group	20.03±0.871	186.16±0.618	82.92±7.784	23.03±18.8034	6.17±0.4186
Test group	19.89±0.877	185.17±0.485	82.31±9.837	23.31±2.2524	6.19±0.4157

RESULTS

Influence of strength training on basic cardiopulmonary ability and sports endurance of basketball players

In terms of the influence of basic cardiopulmonary endurance and sports endurance, the vital capacity and 1-kilometer running index were selected as the judgment basis.

Figure 1. Cardiorespiratory ability of athletes in strength training.

Figure 2 shows the changes of athletes' 1-kilometer running performance in strength training. As can be seen from Figure 2, before the experiment, the performance of the control group was slightly higher than that of the experimental group. After the beginning of the experiment, the results of the two groups of athletes in the 1-kilometer race are

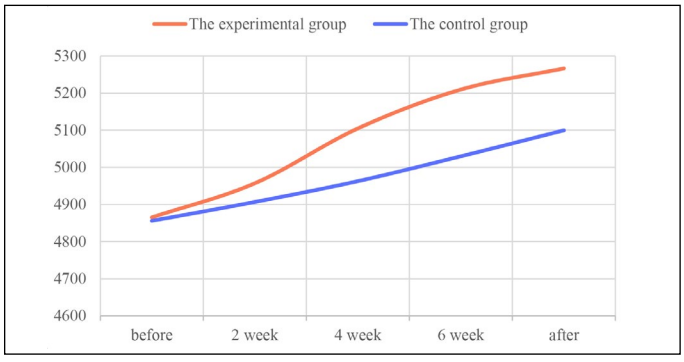

Figure 1. shows the cardiorespiratory ability of athletes in strength training.

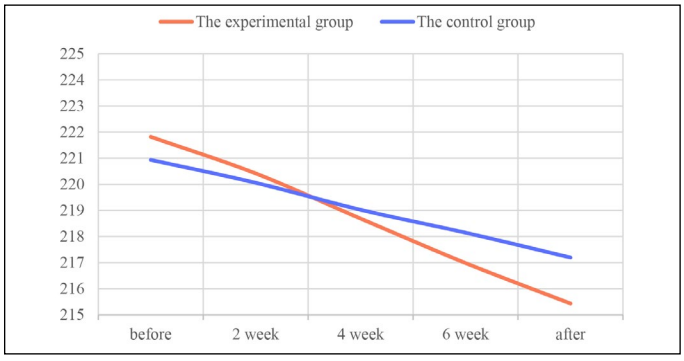

Figure 2. Changes of athletes' 1000m running performance in strength training.

constantly improving, and the frequency and rate of improvement in the experimental group is significantly faster than that in the control group. At the end of the experiment, the average score of the experimental group was significantly higher than that of the control group. This shows that the training program proposed in this paper can better improve the performance of athletes in 1-kilometer running, thus proving the effect of improving cardiorespiratory capacity and sports endurance.

The influence of strength training on the endurance of Basketball Athletes

Table 2 shows the influence of strength training on the basketball endurance indexes of the athletes in the experimental group. It can be seen from the table that the number of dribble jump shots was (6.52 ± 1.390) before the experiment and (8.56 ± 1.284) after the experiment. The number of two minute continuous shots was (8.94 ± 1.416) before the experiment and (11.02 ± 1.688) after the experiment. The running time of "t" was (11.34 ± 0.854) s before the experiment and (10.18 ± 0.897) s after the experiment. The time of three turn back runs with variable distance in the whole field was (31.77 ± 1.857) s before the experiment and (29.62 ± 1.679) s after the experiment. The comprehensive test time was (32.23 ± 1.648) s before the experiment and (29.36 ± 1.561) s after the experiment. It can be seen that the experimental scheme proposed in this paper can significantly improve the athletes' Sports endurance indexes related to basketball after 6 weeks ($P < 0.01$), indicating that there is a significant difference, thus proving the effectiveness of training.

Table 3 shows the influence of strength training on the basketball endurance index of the control group. It can be seen from the table that the number of dribble jump shots was (6.72 ± 1.291) before the experiment and (8.46 ± 1.383) after the experiment. The number of two minute continuous shots was (9.23 ± 1.618) before the experiment and (10.92 ± 1.886) after the experiment. The running time of "t" was (11.42 ± 0.834) s before the experiment and (10.53 ± 0.948) s after the experiment. The time of three turnback runs with variable distance in the whole field was (32.23 ± 2.331) s before the experiment and (30.59 ± 2.282) s after the experiment. The comprehensive test time was (32.34 ± 1.588) s before the experiment and (30.02 ± 2.084) s after the experiment. It can be seen that the traditional physical training of athletes can also enhance the endurance index of basketball, $P < 0.01$, indicating that there is a significant difference.

By summarizing the data in Table 2 and Table 3, the comparison of change values and change rates shown in Table 4 can be obtained. It can be seen from the table that the change rate of the improvement of the dribble jump shot performance of the experimental group was 26.868%, higher than that of the control group (21.842%); The change rate of the improvement of the two minute continuous shooting performance of the experimental group was 20.948%, which was higher than that of the control group (16.282%); The change rate of "t" running performance improvement in the experimental group was 8.664%, higher than that in the control group (5.957%); The change rate of the improvement of the three turn back runs of the whole field in the experimental group was 3.655%, which was higher than that of the control group (1.976%); The change rate of improvement of comprehensive test scores in the experimental group was 5.927%, higher than that of the control group (4.170%).

Table 2. Effect of strength training on basketball endurance indexes of athletes in the experimental group.

Index	Before experiment	After the experiment	P value
Dribble pull-up jumper (pcs)	6.52 ±1.390	8.56 ±1.284	<0.01
Two-minute continuous shooting (pcs)	8.94 ±1.416	11.02 ±1.688	<0.01
"T" run (s)	11.34 ±0.854	10.18 ±0.897	<0.01
Full-court variable-pitch three-turnback run (s)	31.77 ±1.857	29.62 ±1.679	<0.01
Comprehensive Test(s)	32.23 ±1.648	29.36 ±1.561	<0.01

Table 3. Influence of strength training on basketball endurance index of control group athletes.

Index	Before experiment	After the experiment	P value
Dribble pull-up jumper	6.72 ±1.291	8.46 ±1.383	<0.01
Two-minute continuous shooting	9.23 ±1.618	10.92 ±1.886	<0.01
"T" run	11.42 ±0.834	10.53 ±0.948	<0.01
Three turnaround runs with variable pitch	32.23 ±2.331	30.59 ±2.282	<0.01
Comprehensive test	32.34 ±1.588	30.02 ±2.084	<0.01

Table 4. Comparison of basketball endurance indexes between experimental group and control group.

Index	Change rate of experimental group	Change rate of control group
Dribble pull-up jumper	26.868%	21.842%
Two-minute continuous shooting	20.948%	16.282%
"T" run	8.664%	5.957%
Three turnaround runs with variable pitch	3.655%	1.976%
Comprehensive test	5.927%	4.170%

DISCUSSION

Influence of strength training on cardiorespiratory ability of basketball players

First of all, the strength of athletes' cardiopulmonary function can not limit their strength training. Strength training is usually in a very small range of aerobic exercise environment. This shows that strength training is usually in an oxygen free environment. Oxygen does not participate in the energy generation in strength training. The direct energy material of strength training is its own ATP hydrolysis, the decomposition of creatine phosphate and the metabolism of carbohydrates in the anaerobic environment. Second, the main role of cardiopulmonary function in strength training is to help athletes recover quickly. Athletes with strong cardiopulmonary function can recover quickly after training. Training energy supply and self-recovery energy supply are generated by aerobic system. Therefore, cardiopulmonary function plays a greater role in the recovery of the body after strength training. Cardiopulmonary function is very important for athletes. Cardiopulmonary function is directly related to various sports diseases and sports risks. Regular strength training can increase the maximum oxygen uptake of athletes. Increase exercise cardiac output. Reduce the maximum intensity of exercise heart rate. In a word, strength training is helpful to the improvement of cardiopulmonary function.

Influence of strength training on Sports endurance of basketball players

Sports endurance refers to the ability of athletes' muscles to continuously exert force within a certain time range, which is a part of comprehensive quality. The manifestation of endurance is mainly supplied by oxygen, and the improvement of endurance is mainly by the improvement of muscle mass and muscle strength. Improvement of blood circulation. The improvement of respiratory system function and self basic metabolism. Within the scope of sports science, there is no definite conclusion on the

extent of strength training to endurance. For basketball, strength is not the influencing factor of endurance performance. However, it is undeniable that the position of strength and ability in basketball is getting higher and higher. Fierce confrontation can not avoid good strength as the basis. For the all-round development of basketball players, strength training is the basis of other ability training links. It can be seen from the performance of excellent basketball players that excellent endurance provides guarantee for the whole game. Athletes with excellent endurance also show high efficiency in daily strength training. Therefore, in the process of improving strength training, using correct and scientific strength training methods, constantly updating the strength training mode, and formulating the implementation plan of the advanced training system are of great help to the athletes' Sports endurance.

CONCLUSION

In addition to the competition of skills and the collision of strength, basketball also has a physical contest. Basketball has a long time. If there is no good physical endurance and cardiopulmonary strength as support, it will easily lead to lack of endurance and can not complete the whole game. Therefore, it is very necessary to exercise the cardiorespiratory ability and exercise endurance of basketball players. The research scheme proposed in this paper can better improve the athletes' Cardiopulmonary ability, enhance the routine sports endurance and the sports endurance related to basketball, so as to promote the improvement of the athletes' competitive level. Therefore, the scheme proposed in this experiment is worth promoting in sports training.

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AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Luhua nong: writing and execution.

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