LOWER EXTREMITY RESISTANCE TRAINING IN BASKETBALL PLAYERS

TREINAMENTO DE FORÇA NOS MEMBROS INFERIORES EM JOGADORES DE BASQUETEBOL

ENTRENAMIENTO DE FUERZA DE LOS MIEMBROS INFERIORES EN JUGADORES DE BALONCESTO

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ABSTRACT

Introduction: Chinese basketball players have poor lower limb strength, and their movements may be distorted due to insufficient explosive strength in hostile environments. This will cause basketball players to make mistakes. Objective: Evaluate the effect of resistance training on lower extremity explosive strength in basketball players. Methods: 18 basketball players were selected by random sampling. The volunteers were randomly divided into the experimental and the control group. The experimental group used the resistance and routine training protocol for 12 weeks. The data were analyzed employing mathematical statistics. Results: There was no significant difference between the experimental and control groups regarding age, height, weight, and years of training (P>0.05). After explosive training, the standing jump performance of both groups of athletes improved, but the experimental group's performance improved significantly (P<0.05). After explosive training, both groups significantly improved the vertical jump in situ, with higher intensity in the experimental group (P<0.05). The performance of the 30-meter start improved in both groups after explosive training. Conclusion: The presented protocol for resistance training on the lower extremity has a very significant effect in improving the performance of basketball players. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: *Resistance Training; Lower Extremity; Basketball; Athletes.*

RESUMO

Introdução: Atualmente os jogadores de basquetebol chineses têm pouca força nos membros inferiores e seus movimentos podem ser falseados devido à insuficiente força explosiva em ambientes hostis. Isto fará com que os jogadores de basquetebol cometam erros. Objetivo: Avaliar o efeito do treinamento de força sobre a força explosiva dos membros inferiores nos jogadores de basquetebol. Métodos: 18 jogadores de basquetebol foram selecionados por amostragem aleatória. Os voluntários foram divididos aleatoriamente em grupo experimental e controle. O grupo experimental utilizou o protocolo de treinamento de força combinado ao treino de rotina, executado durante 12 semanas. Os dados foram analisados empregando estatísticas matemáticas. Resultados: Não houve diferença significativa entre o grupo experimental e o grupo de controle em termos de idade, altura, peso e anos de treinamento (P>0,05). Após o treinamento explosivo, o desempenho de salto em pé dos dois grupos de atletas melhorou, porém o desempenho do grupo experimental melhorou significativamente (P<0,05). Após o treinamento explosivo, ambos os grupos melhoraram significativamente o salto vertical in situ, com maior intensidade no grupo experimental (P<0,05). O desempenho do arranque de 30 metros melhorou em ambos os grupos após o treinamento explosivo. Conclusão: O protocolo apresentado para treinamento explosivo nos membros inferiores tem um efeito significativo na melhoria do desempenho sobre os jogadores de basquete. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Palavras-chave*:** *Treinamento de Força; Extremidade Inferior; Basquetebol; Atletas.*

RESUMEN

Introducción: En la actualidad, los jugadores de baloncesto chinos tienen poca fuerza en los miembros inferiores y sus movimientos pueden estar distorsionados debido a la insuficiente fuerza explosiva en un entorno hostil. Esto hará que los jugadores de baloncesto cometan errores. Objetivo: Evaluar el efecto del entrenamiento de fuerza sobre la fuerza explosiva de los miembros inferiores en jugadores de baloncesto. Métodos: Se seleccionaron 18 jugadores de baloncesto por muestreo aleatorio. Los voluntarios se dividieron aleatoriamente en grupo experimental y grupo de control. El grupo experimental utilizó el protocolo de entrenamiento de fuerza combinado con el entrenamiento de rutina, ejecutado durante 12 semanas. Los datos se analizaron empleando estadísticas matemáticas. Resultados: No hubo diferencias significativas entre el grupo experimental y el de control en cuanto a la edad, la altura, el peso y los años de entrenamiento (P>0,05). Después del entrenamiento explosivo, el rendimiento de salto en pie de ambos grupos de atletas mejoró, pero el rendimiento del grupo experimental mejoró significativamente (P<0,05). Tras el entrenamiento explosivo, ambos grupos mejoraron significativamente el salto vertical in situ, con mayor intensidad en el grupo experimental (P<0,05). El rendimiento de la salida de 30 metros mejoró en ambos grupos después del entrenamiento explosivo. Conclusión: El protocolo presentado para el entrenamiento explosivo en los miembros inferiores tiene un efecto significativo en la mejora del rendimiento en los jugadores de baloncesto. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Palabras-clave*:** *Entrenamiento de Fuerza; Extremidad Inferior; Baloncesto; Atletas.*

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INTRODUCTION

Basketball is a high-intensity competitive sport. The sport has high demands on the physical fitness of athletes. On the court, basketball players must be fast in breaking through, attacking, and defending fast. These movement techniques require the athlete to have muscular lower body explosiveness.[1] Explosive power plays an essential role in the physical training of basketball players. This paper tests basketball players through strength training with different strength combinations. The purpose is to keep up with the most advanced strength training theories and methods in the world and to grasp better the most effective way to exercise explosive power. This paper provides theoretical references for coaches to formulate better training methods.

METHOD

Research objects

This paper takes 18 basketball players as the research object. Athletes did not suffer any extremity injuries within two months of trial initiation. All athletes can perform the test typically. In this paper, the subjects are randomly divided into two groups: one is the experimental group, and the other is the control group.[2] Nine people per team. The experimental group used the new combination training method in lower body explosive training. The control group exercised lower body strength by the conventional training method. Athletes trained for a total of 12 weeks. The basic information of the two groups is shown in Table 1.

Training plan

This article organizes the training of the junior basketball team according to their training schedule. Trial training was 12 weeks. Everyone has three chances to be tested.[3] There will be a three-minute break after each test. This article takes the highest score as the final record. The assessment indicators in this article cover the standing long jump, standing tall, and 30-meter sprint.

Technical Simulation of Basketball Players

There are technical state variables $q_i\ (i = 1,2,\mathrm{L}\ ,n)$ of N groups of players in the preparatory stage before basketball training. There may be some connection between variables q_i. Each q_i contains a technical response common factor $gj\ (j = 1,2,\mathrm{L}, p)$ and $p \le n$. q_i contains n irrelevant technologically sensitive factors $t_1, t_2, \mathrm{L}, t_m$. There is also no correlation between t and g. Then, the linear relationship between g and t is expressed by formula (1). The technical endurance of athletes at different training intensities is expressed as follows:

This article simplifies it to

$$q_n = \sigma_{n1} g_1 + \sigma_{n2} g_2 + \mathrm{L}\ \ \sigma_{np} g_p + c_n t_n \tag{1}$$

$$Z(t,g) = \kappa(p,r)\,\mathrm{g}A(t,i) + B(i,g)C(r,g) \tag{2}$$

$\kappa(p, r)$ represents the mental state of the athlete under different training intensities. $A(t,\ i)$ represents the skill level of the player. $B(i, g)$ means the athlete should focus on basketball training. $C(r, g)$ represents the athletic motivation of the athlete in the sport. $u(\lambda)$ represents the correlation between the athlete's volitional quality and sports motivation. Y is the correlation coefficient between the athlete's motivation and technical condition.[4] This paper analyzes the will quality and sports motivation of athletes in X to get this index in X.

$$Y = [y_{ij}]_{n\times p} \tag{3}$$

This paper uses the transformation method to calculate the correlation Y between the athlete's dynamic and technical status.

$$z_{ij} = \frac{y_{ij} - \hat{y}_j}{s_{ij}} \tag{4}$$

$$\overline{y}_j = \frac{\sum_{i=1}^{n} y_{ij}}{n} s_j^2 \tag{5}$$

In basketball training, $\overline{y}_j$ represents the athlete's technical decline. s_j^2 represents the mental state of the athlete in basketball training.

$$Z = \frac{[\upsilon_{ip}]_{p\times p}\psi(i,p)}{\overline{y}_p s_p^2} \tag{6}$$

υ_{ip} represents the technical reaction of the athlete, such as fatigue and boredom. $\psi\ (i,\ p)$ is the sensitivity factor to technical stimuli.

$$\psi(i,p) = \frac{AR \times S(j)}{U(i,p)} \tag{7}$$

AR represents the technical awareness of the athlete. $\upsilon S(j)$ represents the ups and downs of the athlete's technical state. It manifests itself as a stimulus from the external environment.

Statistical methods

In this paper, SPSS 17.0 statistical software was used to analyze the data before and after the test.[5] The independent sample size t-test was used for comparison.

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible

Table 1. Basic information on subjects.

	Age	Height (cm)	Weight (kg)	Training years
Control group	22.96±1.7	195.74±6.75	90.8±8.22	3.45±2.13
Test group	23.3±1.61	196.55±7.4	89.41±8.38	3.54±2.07

authorities of Science and Technology College Gannan Normal University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Comparison of experimental group and control group

There was a significant difference in academic performance between the experimental and control groups after explosive strength training (P<0.01). The standing long jump performance of both groups of athletes improved after explosive training, but the improvement was more significant in the experimental group.[6] (Table 2)

Level test results of the experimental group and the control group

The total score of the control group before training was 276.57 ± 6.2 cm, and after training was 279.41 ± 6.72 cm. The total motor performance of the test group in the take-off action before the practice was 275.31+7.14 cm, and the motor performance after training was 281.72±7.46 cm. The comparison between the two groups was statistically significant (P<0.01). (Table 3)

Comparison of experimental group and control group before and after 30-meter sprint and exercise

The 30-meter short-distance sprint score of the control group was 4.76±0.25 seconds. 4.61 ± 0.36 seconds at the end of training. The average score of the experimental group in the 30-meter short-distance sprint was 4.84±0.33 seconds, and the average score after training was 4.49±0.29 seconds. There was a large difference in academic performance between the experimental and control groups after explosive strength training (P<0.01). The 30-meter sprint performance in both groups improved after training, but the improvement in the experimental group was more pronounced.[7] (Table 4)

DISCUSSION

The strengths and weaknesses of basketball players' physical fitness and exceptional sports performance mainly depend on the player's explosive power level. The quality of speed and strength is a comprehensive reflection of the various speed capabilities of basketball players, and it has a significant impact on the effect of basketball technical movements.[8] In addition to strengthening technical movements, good offense and defense should also pay attention to the explosion of muscle strength. Basketball's lower body exceptional strength is a particular strength. It is an extraordinary power. It plays a significant role in basketball, and its power determines the skills and tactics of players.

The control group used traditional exercise methods to perform special strength training for lower limbs.[9] Barbells dominate the training of basketball players. Most of the exercises are performed with the knees bent. The 60 cm high jump highlights the low impact, emphasizing muscle strength when the knee is bent. This is a common approach in basketball. This method can improve the explosive power of the athlete's lower body but ignores the characteristics of basketball technical movements. This makes the basketball player hyperflex and unbalances the development of training. Chinese basketball players lag behind foreign players significantly in the high jump and air time. This results in lower shooting percentages and poorer game viewing. Currently, the particular strength training method for lower limbs adopted in China has achieved some results. Still, it has not been well improved, and the development of athletes' jumping ability is not balanced. There are misunderstandings in athletes' understanding of bouncing and training development.

The experimental group adopted the optimal exercise mode. This makes the movement more inclined to the basic technical movements in basketball. In addition to using the weight of the barbell, you can also use elastic band exercises. Its primary training method is on elastic bands with the knees bent. Elastic bands present a high-to-low resistance curve in strength training.[10] It is similar to the power curve of the human body. Basketball players have long been in a lower center of gravity position. The athlete's lower extremity muscles are in a semi-tense state. The training principle of basketball is to add weight and resistance to the basic technical movements of basketball to realize the transition of movement. This is a transplanted basketball technique. In the actual practice, the training method adopted by the experimental group is from large too small. The difficulty of exercising under the action of the elastic band will also change with the influence of the elastic band. The training effect is consistent with the technical movements used by basketball players in the competition.

Barbell training is a great way to overcome external resistance, and it's a great exercise. Its function is to exercise the maximum strength and muscular endurance of the lower limbs. Because coaches generally accept the barbell training method. Its lack of advanced scientific training methods has caused many coaches to have a vague understanding of sports. Coaches fail to guide athletes through training.[11] properly. The traditional high jump training method is to perform a second total bounce after the foot has landed, which does not combine well with the coherent movements that often occur in actual basketball games.

After 12 weeks of special strength training for the lower limbs, the two groups of athletes showed significant improvement in various indicators such as standing long jump, vertical jump, and 30-meter sprint. The results show that routine lower body explosive power

Table 2. Comparison of experimental group and control group before and during practice (cm).

	Before training	After training
Control group	275.73±12.71	278.99±14.28
Test group	276.57±13.86	284.87±17.01

Table 3. The measured values (cm) of the experimental group and the control group before and after the exercise.

	Before training	After training
Control group	276.57±6.2	279.41±6.72
Test group	275.31±7.14	281.72±7.46

Table 4. Comparison of 30m sprint and test group and control group (s).

	Before training	After training
Control group	4.76±0.25	4.61±0.36
Test group	4.84±0.33	4.49±0.29

and optimal lower body power training can significantly improve their lower body explosive power.[12] Still, due to the limitation of the training method, the development of the jumping ability is uneven. This makes the basketball player's long jump far worse than using the optimal lower body explosive method.

CONCLUSION

The basketball players in control and experimental groups improved the explosive power indicators after training, such as jumping in place, vertical jumping in place, and 30-meter sprinting. In contrast, the experimental group's test results after training significantly improved. Improve. Using the optimal method to carry out special explosive training of lower limbs can better adapt to young basketball players' wexplosive power of lower limbs. It is more in line with the requirements of special basketball skills.

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