EFFECT OF AIR ENDURANCE TRAINING ON ATHLETE'S LOWER LIMB EXPLOSIVE STRENGTH

EFEITO DO TREINAMENTO DE RESISTÊNCIA DO AR NA FORÇA EXPLOSIVA DOS MEMBROS INFERIORES DO ATLETA

EFECTO DEL ENTRENAMIENTO DE RESISTENCIA DEL AIRE EN LA FUERZA EXPLOSIVA DE LOS MIEMBROS INFERIORES DEL ATLETA

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ABSTRACT

Introduction: The explosion force is the neuromuscular system's capacity to overcome resistance with the highest possible contraction speed. It is the result of a kinetic combination between power and speed. The effect of outdoor resistance training is used in several athletics areas to improve the explosive power of the lower limbs. However, there are still few studies focused on basketball athletes. Objective: Verify the effect of outdoor resistance training on the explosive power of the lower limbs of basketball players. Methods: The article uses mathematical statistics and randomized controlled trials by analytical comparison to explore the influence of compound training methods on basketball players' lower explosive limb power. Results: There was no performance gain in the control group at 30 days. Was an improved ability in the experimental group jumping after high-intensity composite training. Conclusion: Compound training plays a crucial role in improving lower limb explosive power in college basketball players. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Exercise; Sports; Athletes; Lower Limb.

RESUMO

Introdução: A força de explosão é a capacidade que o sistema neuromuscular tem de superar resistências com a maior velocidade de contração possível. É resultado de uma combinação cinética entre potência e velocidade. O efeito do treinamento de resistência ao ar livre é utilizado em várias áreas do atletismo para melhorar o poder explosivo dos membros inferiores, porém ainda existem poucos estudos focados nos esportistas de basquete. Objetivo: Verificar o impacto do efeito do treinamento de resistência ao ar no poder explosivo dos membros inferiores dos jogadores de basquete. Métodos: O artigo usa estatística matemática e estudo randomizado controlado por comparação analítica para explorar a influência de métodos de treinamento compostos no poder dos membros explosivos inferiores dos jogadores de basquete. Resultados: Em 30 dias não houve ganho de desempenho no grupo controle em 30 dias. Após o treinamento composto de alta intensidade, a capacidade de salto foi significativamente aprimorada no grupo experimental. Conclusão: O treinamento composto desempenha um papel fundamental na melhoria do poder explosivo dos membros inferiores nos jogadores de basquete universitário. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Exercício físico; Esportes; Atletas; Membro inferior.*

RESUMEN

Introducción: La fuerza de explosión es la capacidad que tiene el sistema neuromuscular para vencer resistencias con la mayor velocidad de contracción posible. Es el resultado de una combinación cinética entre potencia y velocidad. El efecto del entrenamiento de resistencia al aire libre se utiliza en varios ámbitos del atletismo para mejorar la potencia explosiva de los miembros inferiores, sin embargo, todavía hay pocos estudios centrados en los deportistas de baloncesto. Objetivo: Verificar el impacto del efecto del entrenamiento de resistencia al aire libre sobre la potencia explosiva de los miembros inferiores de los jugadores de baloncesto. Métodos: El artículo utiliza la estadística matemática y el ensayo controlado aleatorio por comparación analítica para explorar la influencia de los métodos de entrenamiento compuesto en la potencia explosiva de las extremidades inferiores de los jugadores de baloncesto. Resultados: No hubo ganancia de rendimiento en el grupo de control a los 30 días. Tras el entrenamiento compuesto de alta intensidad, la capacidad de salto mejoró significativamente en el grupo experimental. Conclusión: El entrenamiento compuesto desempeña un papel clave en la mejora de la potencia explosiva de las extremidades inferiores en los jugadores de baloncesto universitarios. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Ejercicio Físico; Deportes; Atletas; Miembro Inferior.*

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INTRODUCTION

The explosive power of the lower limbs has a relatively intuitive impact on the professional level of basketball players. Compound training is a training method that uses the enhancement effect after activation to improve muscle strength and explosive power.[1] We take the effect of compound training on the explosive power of the lower limbs of college basketball players as the research point. Experiments are conducted to explore the effect of compound training on the explosive force of the lower limbs of college basketball players.

METHOD

Research object

The subjects of the study are college basketball players aged 19-23. We adopt an experimental comparison method to analyze the effect of compound training on the explosive force of the lower limbs of college basketball players.

Experimental data acquisition and comparison

Method of obtaining experimental data

According to the different team's college students belong to, the basic comparison items are divided into experimental and control groups. The experimental group will adopt a compound training method.[2] Continuous training is 30 days. The control group still carried out training practice according to the principles of conventional training. In this experiment, the physical fitness level of college students from two different teams will be mastered in advance using physical testing methods. Then we combined the training comparison results to analyze the effect of compound training on the lower limbs of college basketball players. The specific physical fitness test has three parts: The 100-meter fast running test. This test mainly measures whether compound training can help college basketball players improve their running ability on the court. The second is the standing long jump. This test mainly understands that compound training has a positive effect on the physical performance of college basketball players.[3] The third is the high jump. Master the auxiliary role of compound training in improving college students' basketball shooting and jumping ability and jumping height. This can help college students scientifically design the basketball training structure layout. Only the average value will be taken for the data acquisition of this experiment. The differences in individual physical fitness are not within the scope of this experimental study.

Experimental comparison

This experiment is a compound training project. Mainly increase the three items of lunge squat, weight-bearing squat, and squat jump.[4] These three items were not added to the training link in the control group, and practice was still carried out according to the three routine training items. (Table 1) The basic practice period is 30 days. In the experiment, routine training controlled the daily training time within 50 minutes, and the basic training time was 20 minutes.

Table 1. Comparison of training items between the control group and the experimental group.

	Team A (control group)	The b team (experimental group)
Lunge	none	have
Sitting leg flexion and extension	have	have
Prone curl	have	have
Weight-bearing squat	none	have
Squat jump	none	have
Squat up	have	have

Predictive modeling and simulation of vulnerable parts of the body during exercise

We denote the set of all factors that may affect the body part during strenuous exercise as

$$U = \{u_1.u_2, \cdots, u_n\} \quad (1)$$

We express the set of points where all body parts may be damaged as

$$V = \{v_1.v_2, \cdots, v_m\} \quad (2)$$

Different types of factors can be divided into different sub-categories. We set the number of different sub-categories in different categories to be the same:

$$u_i = \{u_{i1}, u_{i2}, \cdots, u_{ig}\} \quad (3)$$

g represents the number of sub-category influencing factors in different categories in the influencing factors. There is $U = \bigcup_{i=1}^{n} u_i$ that meets $u_i \cap u_j = \Phi$ when it meets $i \neq j$ (where Φ represents the empty set). Set the confidence level $r_{ij} = v_j(u_i)$ that the i strenuous exercise influencing factor leads to the j physical injury point. r_{ij} represents the degree of membership of u_i to u_i. It is the probability value of the i physical injury point caused by the i strenuous exercise influencing factor. Its satisfaction

$$0 \leq r_{ij} < 1 (i = 1, 2, \cdots, n; j = 1, 2, \cdots m) \quad (4)$$

We use equation (4) to obtain the probability value of the injury point of the body. The fuzzy set matrix on decision V is

$$R = \begin{pmatrix} R_1 \\ R_2 \\ \vdots \\ R_n \end{pmatrix} = \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{pmatrix} \quad (5)$$

Forming the functional relationship f: $U, \rightarrow F(V)$ between U, V makes the following formula true:

$$u_i \rightarrow f(v_i) = \frac{r_{i1}}{v_1} + \frac{r_{i2}}{v_2} + \cdots + \frac{r_{im}}{v_m} \quad (6)$$

RESULTS

Table 2 is obtained based on the physical fitness test before the experiment. Among them, the control group's comprehensive advantage mainly lies in short-term running explosiveness.[5] However, compared with the experimental group, its jumping ability is relatively inferior.

From Table 3, it can be seen that compound training helps improve the explosive power of the lower limbs of athletes. The performance improvement of the control group within 30 days was not obvious. The bounce ability improved significantly after high-intensity compound

Table 2. Physical fitness test results of the team players before the experiment.

	100m race (s)	Standing long jump (cm)	High jump (cm)
Team A (control group)	11.85	265	160
B team (experimental group)	11.95	268	163

Table 3. Comparison results between the control and experimental groups after the compound training experiment.

	100m race (s)	Standing long jump (cm)	High jump (cm)
Team A (control group)	11.68	268	164
B team (experimental group)	11.43	276	172

training in the experimental group. In the 100-meter track and field test, the performance improvement of the control group was significantly bigger than that of the long jump. Still, the performance improvement was not fast compared with the experimental group.[6] It can be seen that compound training plays an irreplaceable role in enhancing the explosive power of the lower limbs of athletes.

DISCUSSION

Features and influence of compound training

The essence of compound training is to form an overall dynamic linkage by combining a single training content. We integrate the content of various actions so that the application of sports training projects can improve the comprehensive physical fitness of athletes in a targeted manner. For example, applying the squat up a training program in compound training is not a single exercise of strengthening the power of the leg muscle tissue. In this process, athletes' joint muscle mobilization ability and heart movement adaptability will improve further. Therefore, the squat-up exercise design can be targeted to improve many aspects of the sports function according to the athlete's lower limb exercise level.[7] This solves the problem of insufficient effectiveness due to a long training period in the conventional training mode. In addition, compound training is also a scientific way to train athletes to form muscle memory of the lower limbs. Using the continuous improvement of lower limb neuron perception level makes it possible to provide high-intensity action feedback in a relatively short period in the development of basketball sports. This can ensure the flexibility of athletes' sports reactions and provide a basic training guarantee for athletes' on-the-spot performance to the maximum.

The production of enhancement effect after activation in compound training

The enhancement effect after activation is essentially an internal condition strengthening stimulus. Use the increase in exercise load to stimulate the athlete's stress response.[8] This allows it to achieve the best state of excitement through short-term functional adjustments. Under the induction of high-intensity exercise, it helps athletes improve their ability to mobilize the kinetic energy of the lower limbs. This realizes the enhancement of short-term exercise ability. Although the enhancement effect after activation has a short burst duration, it can provide athletes with uninterrupted strength support during the time node of its limited function enhancement. This allows athletes to cope with sports competitions in a good posture for some time, even under conditions of physical fatigue.

Compound training strengthens the body's strength

Body strength is the most basic condition for supporting athletes to produce high-intensity explosive power. Compound training is applied to weight-bearing semi-squat training items.[9] This is a scientific method to improve the physical strength of college athletes. Weight-bearing squats can further increase the load strength of the leg muscles and joints. Generate stronger downforce through weight-bearing. When the athlete's lower limbs exert upward force, the weight-bearing pressure can generate stronger gravity. In this process, athletes must strengthen the joint supportability and muscle compression ability to complete the whole process of weight-bearing squats better.

Suggestions for improving the explosive power of lower limbs of college basketball players by compound training

Increasing the proportion of combined training physical fitness training application

Increasing the application proportion of compound training for college basketball players can better embed compound training into the existing training mechanism without changing the original training system structure.[10] This improves the short-term explosive ability of college basketball players. Use the practice of compound training of lower limbs to strengthen and make up for the excessive physical energy consumption and lack of physical fitness of college young basketball players. This creates favorable conditions for better professional training of college students in basketball sports in the subsequent stages. In addition, it should be noted that compound training can form an effective connection with conventional training items, and at the same time, ensure that common training and compound training form a content relationship. Use routine training practice application as a carrier to promote the improvement of compound training level. This ensures that compound training improves the explosive power of the lower limbs of college basketball players. This method can lay a solid training foundation for the steady improvement of its comprehensive ability.

Add compound training and comprehensive practice projects

Adding compound training comprehensive practice items can improve the fit of compound training content.[11] Through the experiment, we can understand the difference in physical fitness of different students. They have different application requirements for compound training programs. Therefore, we must select appropriate training items according to the physical level of college basketball players. This can ensure that the compound training of college students can better compensate for individual differences.

Improve athletes' awareness of independent exercise in compound training

Cultivate the autonomous consciousness of college basketball players in compound training, and strengthen the compound training of athletes.[12] This will better play the essential role of compound training. In turn, the explosive power of the lower limbs of college students' basketball can be improved. Cultivating the autonomous training consciousness of college basketball players is an effective way to strengthen college students' compound training ability fully. This is conducive to scientifically advancing compound training practice exercises. In addition, cultivating the consciousness of autonomous training of college basketball players is also an effective way to improve the willpower of college basketball players.

CONCLUSION

Compound training plays a key role in improving the explosive power of the lower limbs of college basketball players. This method is an effective way to enhance college basketball players' physical fitness and professional skills. College basketball sports training can optimize the existing sports training application system from compound training. This can improve the professional practice level of compound training in cultivating basketball sports talents. This provides help for college students to improve their basketball sports ability.

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