

IMPACT OF PLYOMETRIC TRAINING ON THE LOWER LIMB STRENGTH OF GYMNASTS



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IMPACTOS DO TREINO PLIOMÉTRICO NA FORÇA DOS MEMBROS INFERIORES DE GINASTAS

IMPACTO DEL ENTRENAMIENTO PLIOMÉTRICO EN LA FUERZA DE LOS MIEMBROS INFERIORES DE GIMNASTAS

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ABSTRACT

Introduction: Plyometric training consists of a compound of stretching followed by immediate contraction, favoring the elastic properties of the soft tissues and aiming to promote a higher explosive force in the athletes. **Objective:** Explore the impact of plyometrics on aerobic gymnastics practitioners' explosive force in the lower limbs. **Methods:** In this experiment, a total of 16 aerobic gymnastics athletes were selected and divided into two groups: the control group and the experimental group. The control group remained with their usual training, while a sport-specific plyometric protocol was added to the experimental group. **Results:** Composite plyometric training can improve the short-distance running ability of aerobic gymnastics athletes; the effect of running 5m in the start and 10m in the start was statistically evidenced. However, the 20m run had similar results. **Conclusion:** The explosive power of the lower limbs in different activities is related to the specific training of aerobic gymnastics athletes focused on the muscles corresponding to the activity, showing a significant positive correlation.

Level of evidence II; Therapeutic studies - investigation of treatment outcomes.

Keywords: Plyometric Exercise; Gymnastics; Athletes; Muscle Strength.

RESUMO

Introdução: O treinamento pliométrico consiste num composto de alongamento seguido de imediata contração, favorecendo as propriedades elásticas dos tecidos moles visando promover uma maior força de explosão nos atletas. **Objetivo:** Explorar os impactos da pliometria sobre a força explosiva nos membros inferiores dos praticantes de ginástica aeróbica. **Métodos:** Neste experimento, um total de 16 atletas em ginástica aeróbica foram selecionados e divididos em dois grupos: o grupo de controle e o grupo experimental. O grupo controle permaneceu com seu treinamento usual enquanto ao grupo experimental foi acrescido um protocolo pliométrico específico para o esporte. **Resultados:** O treinamento composto de pliometria pode melhorar a capacidade de corrida de curta distância de atletas de ginástica aeróbica, o efeito de correr 5m em largada e 10m em largada foi estatisticamente evidenciado, porém a corrida de 20m não teve resultados diferentes. **Conclusão:** O poder explosivo dos membros inferiores em diferentes atividades está relacionado ao treinamento específico dos atletas de ginástica aeróbica focado nos músculos correspondentes à atividade, evidenciando uma correlação positiva significativa.

Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.

Descritores: Exercício Pliométrico; Ginástica; Atletas; Força Muscular.

RESUMEN

Introducción: El entrenamiento pliométrico consiste en un compuesto de estiramientos seguido de una contracción inmediata, favoreciendo las propiedades elásticas de los tejidos blandos con el objetivo de promover una mayor fuerza explosiva en los deportistas. **Objetivo:** Explorar los impactos del entrenamiento pliométrico sobre la fuerza explosiva en los miembros inferiores de los practicantes de gimnasia aeróbica. **Métodos:** En este experimento, se seleccionaron un total de 16 atletas de gimnasia aeróbica y se dividieron en dos grupos: el grupo de control y el grupo experimental. El grupo de control siguió con su entrenamiento habitual mientras que al grupo experimental se le añadió un protocolo pliométrico específico para el deporte. **Resultados:** El entrenamiento compuesto de pliometría puede mejorar la capacidad de correr distancias cortas de los atletas de gimnasia aeróbica, se evidenció estadísticamente el efecto de correr 5m en salida y 10m en salida, sin embargo, la carrera de 20m no tuvo resultados diferentes. **Conclusión:** La potencia explosiva de los miembros inferiores en diferentes actividades está relacionada con el entrenamiento específico de los atletas de gimnasia aeróbica centrado en los músculos correspondientes a la actividad, evidenciando una correlación positiva significativa.

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

Descritores: Ejercicio Pliométrico; Gimnasia; Atletas; Fuerza Muscular.



INTRODUCTION

Rapid stretching compound training, also known as “plyometric training”, “super isometric training” and “spring rebound training”, is a training mode developed based on the theoretical basis of muscle “lengthening-shortening cycle”, it was later applied to various sports to develop muscle strength and achieved good training results, its biggest feature is that it is practiced in a fast dynamic process, develop explosive power in specific muscles. To sum up, the rapid contraction compound training has been applied to practice very early, so it is not a novel training method. It is just that there is a lack of systematic theory, training system and training plan during this period, later, scholars put these scattered trainings, the method is generally defined as “Plyometrics”, which lays the foundation for the training system of fast scaling compound training.^{1,2}

RESEARCH OBJECTS AND EXPERIMENTAL DESIGN

Research objects

The author selects a total of 16 aerobics athletes from province A, all of whom have more than 5 years of sports training experience, and have received systematic strength training before participating in the experiment, have a preliminary understanding of the basic movement essentials of the fast-stretching compound training method. In order to ensure the validity of the study and the reliability of the test, the impact strength of the test calf was tested before the joint, 8 men and 8 women were divided into groups, 4 men and 8 women. There were 4 female athletes in the control group and the experimental group, and two groups of male and female athletes. The number of people is equal, and the experimental period lasted for 8 weeks, training once a week on Wednesdays and Sundays, and each training session was 1h. All athletes participated in the experimental group for high-speed training, while the athletes in the control group underwent general training.^{3,4}

Experimental Design

First, the experimental group and the control group performed general strength training at the same time to increase neuromuscular control, improve core strength, increase body stability, and lay the foundation for subsequent fasting. Experimental group stretching training. After general strength training, the experimental group performed a combination of speed training and contraction.^{5,6} The training conditions of the experimental group and the control group are shown in Table 1. The control group continued to carry out strength training as an auxiliary.

Table 1. Training program of experimental group and control group.

Experimental group (rapid expansion and contraction compound training)	Control group (general strength training)
(1) 10x5 groups of deep jump exercises (male 50 cm, female 40 cm)	Barbell Press 30kg, 12x3 sets
(2) Single-leg alternate jumping 10x5 groups (male 15 cm, female 12 cm)	Barbell deadlift 30 kg, 12 x 3 sets
(3) 25 sx4 calf raises with continuous round-trip jumps	Barbell Squat 15 kg, 12x3 sets
(4) Right-angle fast rotation jump	Flat Bench Press 30kg, 12x3 sets
(5) 20x5 front hurdles (male 25 em, female 15 cm)	Barbell Curl 15 kg, 12x3 sets
(6) Pentagonal hurdles jump quickly for 5 laps	Pull-ups (self-weight), 8 x3 sets

Table 2. Comparative analysis of the explosive force of the lower limbs in different directions between the experimental group and the control group/cm.

Project	Control group		Test group	
	Before experiment	After the experiment	Before experiment	After the experiment
standing long jump	218.13±2.05	219.24±31.25	218.46±28.99	219.33±27.35
Left standing long jump	168.35±24.32	169.38±25.38	170.38±32.79	169.29±28.77
Right standing long jump	180.88±25.33	181.36±24.88	184.79±21.68	183.55±21.99

This test typically compares the long jump, running performance, and extraordinary ability of the experimental and control groups to see if there is a significant difference in the experimental group's performance. and control. Group and determine the effect of a mixed training method on lower-body power in aerobic athletes.

ETHICAL COMPLIANCE

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

RESULTS ANALYSIS

Comparative analysis of the explosive power of the lower limbs in different directions between the experimental group and the control group

Table 2 shows that there was no difference in vertical jump, left vertical jump, and right vertical jump between the control group and the test group before and after the test ($p > 0.05$). After the experiment, there was a significant difference in the anterior vertical jump between the experimental group and the control group, and the left vertical jump was significantly worse ($p < 0.01$); experimental group and control group ($p < 0.05$).

Comparative analysis of short-distance running ability between the experimental group and the control group

Table 3 shows that there was no significant difference between the control group and the experimental group in the 5m race before and after the test, and between the control group and the experimental group in the 10m and 20m race ($p > 0.05$), there is a difference in 5m sprint performance between the experimental and control groups. ($p < 0.01$), there is no difference between running 10 meters ($p < 0.05$) and running 20 meters ($p > 0.05$).^{7,8}

Correlation analysis between explosive power ability of lower limbs in different directions and special ability performance

As can be seen from Figure 1, the front standing long jump and the bottom line back and forth, the left standing long jump and the left sliding sprint, and the left standing long jump have a better relationship with the left side. The r-values for the back swing, right standing long jump, and right back swing were 0.75 ($p < 0.01$), 0.68 ($p < 0.01$), 0.45 ($p < 0.02$) and 0.37 ($p < 0.02$). . Important; the long jump was positively correlated with the right ski sprint, the r value was 0.59 ($p < 0.05$), which was statistically significant.^{9,10}

Table 3. Comparative analysis of short-distance running ability between the experimental group and the control group/s.

Project	Control group		Test group	
	Before experiment	After the experiment	Before experiment	After the experiment
5 m punch	1.25±0.03	1.23±0.02	1.22±0.05	1.18±0.04
10m sprint	1.68±0.07	1.66±0.03	1.65±0.08	1.67±0.06
20m sprint	3.22±0.04	3.18±0.06	3.11±0.05	3.12±0.04

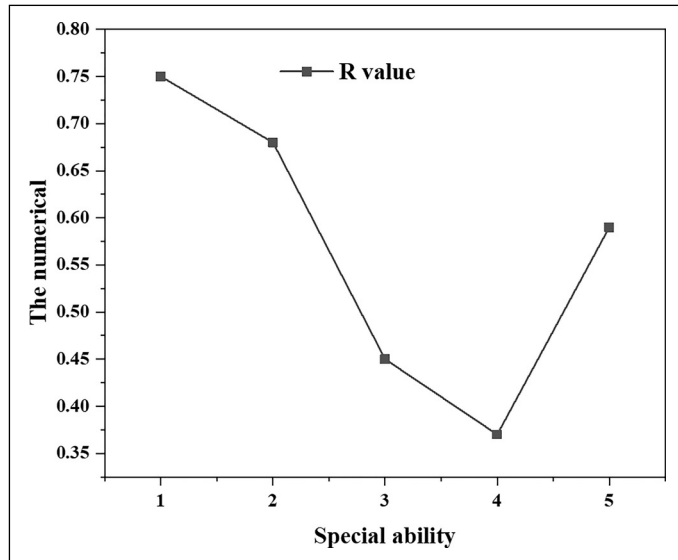


Figure 1. Correlation analysis of lower extremity explosive power in different directions and special ability performance.

CONCLUSION

The authors conducted 8 weeks of long-term exercise and general strength training between the experimental and control groups and found no significant differences in pre- and post-test data

between the experimental and control groups. Most of the movements in the experimental group were significantly improved, while the movements in the control group did not change much, and the data were very different, indicating that the speed training method is very important. Effects of speed training on lower body explosive power and performance improvement of aerobic athletes. In terms of sprinting skills, the 5m sprint and 10m sprint have significantly improved, but the 20m sprint has not been significantly improved. Calf fracture forces in different directions correlate well with specific conditions. Physical fitness of aerobic athletes in practice.

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