

EFFECTS OF JUMP TRAINING ON THE REPAIR OF BONE INJURIES



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EFEITOS DO TREINAMENTO DE SALTO NO REPARO DE LESÕES ÓSSEAS

EFFECTOS DEL ENTRENAMIENTO DE SALTO EN LA REPARACIÓN DE LESIONES ÓSEAS

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ABSTRACT

Introduction: Long jump is a technically complex sport. Its technique encompasses running, jumping, and landing. It has high speed, fast pace, and high-intensity characteristics. **Objective:** Study the effect of long jump training on bone repair and rehabilitation of human fatigue injury in the lower limbs of young athletes. **Methods:** A scientific literature search, experimental comparison, mathematical statistics, and other research methods were used to analyze the causes and mechanisms of sports injuries in distance jumpers. An eccentric contraction training was formulated and tried out in practice. **Results:** After 12 weeks of eccentric contraction training, the FMS scores of jumpers in jumping improved, existing problems were recovered, and eccentric contraction training reduced the probability of sports injuries in jumpers. **Conclusion:** Eccentric contraction training improves the performance of young athletes in the long jump, greatly increases stability, and reduces the likelihood of future sports injuries.

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

Keywords: Physical Education and Training; Sports; Fractures, Stress.

RESUMO

Introdução: O salto em distância é um esporte tecnicamente complexo. Sua técnica engloba corrida, saltos e aterrissagem. Tem as características de alta velocidade, ritmo rápido e alta intensidade. **Objetivo:** Estudar o efeito do treinamento de salto à distância no reparo ósseo e na reabilitação da lesão por fadiga humana nos membros inferiores de jovens atletas. **Métodos:** Foi utilizada uma consulta de literatura científica, comparação experimental, estatística matemática e outros métodos de pesquisa para analisar as causas e mecanismos das lesões esportivas em saltadores à distância. Um treinamento excêntrico de contração foi formulado e experimentado na prática. **Resultados:** Após 12 semanas de treinamento de contração excêntrica, a pontuação FMS dos saltadores em salto melhorou, os problemas existentes foram recuperados e o treinamento de contração excêntrica reduziu a probabilidade de lesões esportivas nos saltadores. **Conclusão:** O treinamento de contração excêntrica melhora o desempenho dos jovens atletas no salto em distância, aumenta muito a estabilidade e reduz a probabilidade de futuras lesões esportivas.

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

Descritores: Educação Física e Treinamento; Esportes; Fraturas de Estresse.

RESUMEN

Introducción: El salto de longitud es un deporte técnicamente complejo. Su técnica incluye correr, saltar y aterrizar. Tiene las características de alta velocidad, ritmo rápido y alta intensidad. **Objetivo:** Estudiar el efecto del entrenamiento de salto de longitud en la reparación ósea y la rehabilitación de la lesión por fatiga humana en las extremidades inferiores de jóvenes atletas. **Métodos:** Se utilizó la consulta de la literatura científica, la comparación experimental, la estadística matemática y otros métodos de investigación para analizar las causas y los mecanismos de las lesiones deportivas en los saltadores de distancia. Se formuló un entrenamiento de contracción excéntrica y se probó en la práctica. **Resultados:** Tras 12 semanas de entrenamiento de contracción excéntrica, las puntuaciones de FMS de los saltadores de longitud mejoraron, los problemas existentes se recuperaron y el entrenamiento de contracción excéntrica redujo la probabilidad de lesiones deportivas en los saltadores. **Conclusión:** El entrenamiento de la contracción excéntrica mejora el rendimiento de los jóvenes atletas en el salto de longitud, aumenta en gran medida la estabilidad y reduce la probabilidad de futuras lesiones deportivas. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Educación y Entrenamiento Físico; Deportes; Fracturas por Estrés.



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INTRODUCTION

The long jump is a technically complex sport, its complete technique consists of run-up, take-off, aerial and landing, it has the characteristics of high speed, fast rhythm and high intensity, therefore, during the long jump, the human body has to bear a great impact on the ground. This is easy to produce corresponding damage.¹

Shao X pointed out that long jumpers are prone to patella fracture, patella injury, knee medial collateral ligament injury, knee meniscus injury, tibial and fibular fatigue periostitis, traumatic achilles tendon periarthritis, ankle sprains, sports-induced heel pain, hamstring strains, and lumbar strains.² Ss A mentioned that both professional long jumpers and ordinary beginners have a very high probability of getting sports injuries.

Most of the injuries occurred in the ankle and knee joints.³ Orchard J W pointed out that the injuries of long jumpers are mainly distributed in the ankles, knees, back of the thighs, etc., the main types of injuries are muscle strains and strains. At the same time, it is pointed out that most of the conditions for sports injuries occur in speed exercises and technical exercises.⁴ Tgma B pointed out that the long jumper's knee joint sports injury is an acute injury caused by excessive local load on the knee joint.⁵ Bj A used data on Chinese adolescent male triple jumpers to study sports injuries. It is pointed out that from the perspective of training, if the training speed is fast and the technical level in the practice process is average, sports injuries are often prone to occur. In addition, he believes that unreasonable and unscientific training methods in the training process are the main factors leading to sports injuries.⁶ Mann S et al. As young athletes place more and more demands on their bodies, injuries of this type of population occur frequently and are becoming more common. The main cause of injury in youth athletes is the accumulation of overuse, rather than an acute event.⁷ Matsuda D K used univariate and multiple Cox regression analyses to calculate hazard ratios for risk factors for first-reported injuries. The main finding was that increased training load, increased training intensity, and reduced sleep volume resulted in a higher risk of injury.⁸

The purpose of the author's research is to test the effectiveness of sports injury prevention by means of eccentric contraction training, therefore, the choice of the speed and the load intensity of the eccentric contraction training to formulate the training program will not affect the main purpose of the author's research. Therefore, according to the actual needs, the eccentric contraction training at different speeds will be involved in the design of the eccentric training program.

METHOD

Documentation method

From CNKI, Wanfang data platform SpecialSci foreign language characteristic thematic database, EBSCO sports science network database and other platforms, the keywords "prevention of youth sports injuries", "Centrifugal contraction training" and "Preventing adolescents sports injuries" were searched, and carry out relevant screening to understand the research methods and means related to adolescent injury and eccentric contraction training.⁹

Mathematical statistical analysis method

SPSS17.0 and Excel2003 were used for statistical processing and analysis of the obtained data. Statistical analysis was carried out on the sample data using the relevant iso-mathematical statistical methods, and the paired sample t-test was used to indicate statistical significance with a p value less than 0.05. Provides scientific theoretical data for eccentric contraction training to prevent sports injuries in young long jumpers.¹⁰

Experimental analysis and comparison method

By testing teenage long jumpers before eccentric training, analyze the lack of elements in its current training. And provide data for the construction of a more targeted eccentric training plan, and finally through the data collection in the middle and later stages of the implementation of the plan, analyze and study the effectiveness of the eccentric contraction training plan.

Ethical Compliance

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

RESULTS

Analysis and discussion of sports quality indicators and long jump performance test results of long jumpers

By comparing the data changes of relevant indicators, the author found that the application of eccentric contraction training methods improved the lower limb strength and explosive power of young athletes. By training its eccentric contractions for 12 weeks, we can derive from Figure 1, this group of young long jumpers who have not trained for a long time, their performance in the 30-meter run, half squat and long jump has improved significantly.

Diagnostic evaluation of FMS test results before eccentric contraction training in long jumpers

As can be seen from Table 1, the highest score of the 9 youth athletes is 17 points, the lowest is 13 points, and the overall average score is 15.4 points. This shows that the training methods of young athletes have been improved in recent years, and they are no longer the training mode that emphasizes large amounts of exercise and heavy loads. One of them did not pass the passing score, indicating that his basic athletic ability is weak and the probability of being injured during training is high.

FMS test results in the later period of eccentric contraction training for long jumpers

From Table 2, we can see that the highest score among the 9 youth athletes is 19 points, and the lowest score is 15 points. The average score of 9 people is 17 points, which is 10% and 7% higher than the average score of the first and second tests, of which 0 people are less than 14 points, accounting for 0% of the total number. Scores of 17 or higher accounted for 56% of the total, and overall, eccentric training has made great strides among junior long jumpers. Explain that most youth

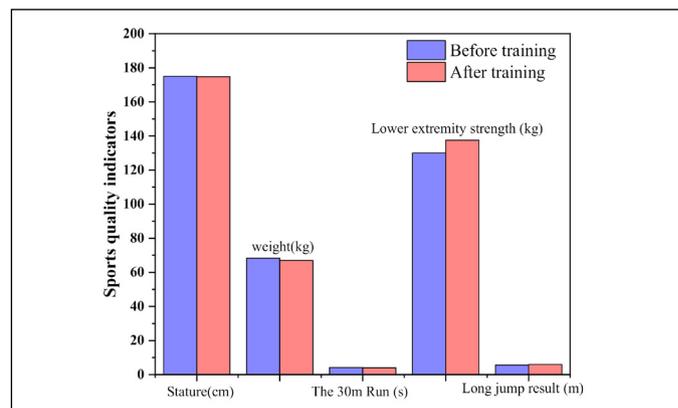


Figure 1. Histograms of athletic quality indicators and long jump performance before and after eccentric contraction training.

Table 1. FMS test results before eccentric training.

| Test team | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------------|------|------|------|------|------|------|------|------|------|
| Squat test | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 |
| Step test | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| Straight lunge squat | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |
| Shoulder flexibility | 3 | 2 | 3 | 0 | 2 | 2 | 1 | 2 | 3 |
| Exclusion test | no | no | no | Yes | no | no | no | no | no |
| Straight leg raise | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 |
| Trunk stability | 2 | 2 | 0 | 2 | 0 | 2 | 2 | 1 | 2 |
| Exclusion test | no | no | Yes | no | Yes | no | no | no | no |
| Rotational stability | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 |
| Exclusion test | no |
| Total score | 17 | 17 | 15 | 14 | 13 | 17 | 16 | 14 | 16 |
| The average score | 2.43 | 2.43 | 2.14 | 2.00 | 1.85 | 2.43 | 2.29 | 2.00 | 2.29 |

Table 2. FMS test results in the later stage of eccentric training.

| Test team | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------------|------|------|------|------|------|------|------|------|------|
| Squat test | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| Step test | 2 | 2 | 2 | 2 | 2 | 3 | 1 | 2 | 2 |
| Straight lunge squat | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 |
| Shoulder flexibility | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 |
| Exclusion test | no |
| Straight leg raise | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 |
| Trunk stability | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| Exclusion test | no |
| Rotational stability | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| Exclusion test | no |
| Total score | 19 | 18 | 18 | 16 | 15 | 18 | 18 | 17 | 17 |
| The average score | 2.72 | 2.57 | 2.57 | 2.29 | 2.14 | 2.57 | 2.57 | 2.43 | 2.57 |

athletes have improved their body stability and muscle control. In this FMS data, it can be seen that in the two indicators of trunk stability and rotational stability, the improvement of youth long jumpers is obvious, the improvement in these aspects means that the probability of sports injuries for young long jumpers is greatly reduced.

Comparative analysis of FMS test results before, during and after eccentric contraction training

As can be seen from Table 3, the three test results have significant differences ($P < 0.05$), among them, after 3 months of training, the average score of 9 young long jumpers increased by 1.6 points, about 10%. Basically, every young athlete's FMS score has improved, the most prominent improvement is 3 points, and the minimum improvement is 1 point. It can be seen that in the past three months, specialized eccentric contraction training has improved the physical health of young long jumpers, in terms of recovery from old injuries, eccentric contraction training also has a good effect.

DISCUSSION

According to the results and data changes obtained from the FMS test, the following three conclusions can be confirmed; First, the application of eccentric contraction training methods has greatly improved the sports injuries of young athletes; Second, the application of eccentric contraction training has improved the muscle flexibility, balance

Table 3. FMS test results before and after eccentric training.

| Testers | Pre-test scores | Post-test scores |
|-------------------|-----------------|------------------|
| 1 | 17 | 19 |
| 2 | 17 | 18 |
| 3 | 15 | 18 |
| 4 | 14 | 16 |
| 5 | 13 | 15 |
| 6 | 17 | 18 |
| 7 | 16 | 18 |
| 8 | 14 | 17 |
| 9 | 16 | 17 |
| The average score | 15.4 | 17 |

and stability of young athletes; Third, from the numerical changes of the test, it is confirmed that the author's selection of the experimental content and the formulation and arrangement of the training plan are reasonable and effective.

CONCLUSION

After 12 weeks of eccentric training, adolescent long jumpers generally improved their FMS scores. The old problems in the young long jumpers have been recovered to a great extent, and the eccentric contraction training can greatly improve the trunk stability and shoulder flexibility of the young long jumpers, reduced the incidence of sports injuries in juvenile long jumpers. Eccentric contraction training can enhance the strength and explosiveness of the lower limbs of young athletes, and improve the stability and balance of young athletes. It shows that eccentric contraction training can improve muscle strength more significantly, so the probability of sports injury is lower.

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