

STRENGTH TRAINING FOR INJURY PREVENTION IN AEROBIC GYMNASTICS

TREINAMENTO PREVENTIVO DE FORÇA DE LESÕES NA GINÁSTICA AERÓBICA

ENTRENAMIENTO PREVENTIVO DE FUERZA DE LAS LESIONES EN LA GIMNASIA AERÓBICA



ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

Yin Ningning¹ 
(Physical Education Professional)

1. Shandong Sport University,
School of Sports Art, Jinan,
Shandong, China.

Correspondence:

Yin Ningning
Jinan, Shandong, China. 250102.
yinningning@sdpei.edu.cn

ABSTRACT

Introduction: Aerobics is a combination of strength and beauty. The complexity of its movements is extreme, and it is easy to cause injuries from sports training in its athletes. **Objective:** Analyze the effect of strength training on injury prevention in aerobic gymnastics. **Methods:** The total duration of the experiment was 8 weeks, and the athletes in the experimental group were trained three times a week with the help of teachers in a dedicated strength training program. The exercise principle of the control group was to perform physical strength training based on running. The control group did not have the special protocol intervention. Their scores were collected and compared before and after the intervention. Statistical analysis was performed for scientific appreciation of the collected data. **Results:** The scores on the deep squat, obstacle avoidance, front and back squat, scapular girdle joint flexibility, straight leg raising, stable trunk flexions, and rotational stability tests in the experimental group were all statistically differentiated. However, the control group's scores had little difference, showing a slight decrease. **Conclusion:** It is recommended to insert the presented program into the conventional aerobic gymnastics training, always with changes that adjust the reality of the athletes' situation, protecting their physical health and improving their competitive level. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

Keywords: Resistance Training; Gymnastics; Injuries, Sports.

RESUMO

Introdução: A ginástica aeróbica é uma combinação de força e beleza. A complexidade de seus movimentos é extrema sendo fácil causar lesões oriundas de treinamentos esportivos em seus atletas. **Objetivo:** Analisar o efeito do treinamento de força na prevenção de lesões na ginástica aeróbica. **Métodos:** A duração total do experimento foi de 8 semanas, os atletas do grupo experimental foram treinados três vezes por semana com a ajuda de professores em um programa dedicado ao treinamento de força. O princípio do exercício do grupo de controle foi realizar o treinamento de força física baseado na corrida. O grupo controle não teve a intervenção do protocolo especial. Suas pontuações foram coletadas e comparadas, antes e após a intervenção. Efetuou-se uma análise estatística para apreciação científica dos dados coletados. **Resultados:** As pontuações em agachamento profundo, desvio de obstáculos, agachamento dianteiro e traseiro, flexibilidade das articulações da cintura escapular, elevação reta das pernas, flexões estáveis de tronco e testes de estabilidade rotacional no grupo experimental foram todos estatisticamente diferenciados. Entretanto, as pontuações do grupo de controle tiveram pouca diferença, demonstrando até mesmo uma ligeira diminuição. **Conclusão:** Recomenda-se inserir o programa apresentado ao treinamento de ginástica aeróbica convencional, sempre com alterações que ajustem a realidade da situação dos atletas, protegendo sua saúde física e melhorando o seu nível competitivo. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Treinamento de Força; Ginástica; Lesões Esportivas.

RESUMEN

Introducción: La gimnasia aeróbica es una combinación de fuerza y belleza. La complejidad de sus movimientos es extrema siendo fácil que se produzcan lesiones originadas por entrenamientos deportivos en sus atletas. **Objetivo:** Analizar el efecto del entrenamiento de fuerza en la prevención de lesiones en la gimnasia aeróbica. **Métodos:** La duración total del experimento fue de 8 semanas, y los atletas del grupo experimental fueron entrenados tres veces por semana con la ayuda de profesores en un programa dedicado al entrenamiento de la fuerza. El principio de ejercicio del grupo de control fue realizar un entrenamiento de fuerza física basado en la carrera. El grupo de control no tuvo la intervención del protocolo especial. Se recogieron sus puntuaciones y se compararon antes y después de la intervención. Se realizó un análisis estadístico para la apreciación científica de los datos recogidos. **Resultados:** Las puntuaciones en las pruebas de sentadilla profunda, desvío de obstáculos, sentadilla frontal y posterior, flexibilidad de la articulación de la cintura escapular, elevación de la pierna recta, flexiones estables del tronco y estabilidad rotacional en el grupo experimental se diferenciaron estadísticamente. Sin embargo, las puntuaciones del grupo de control no presentaban apenas diferencias, mostrando incluso un ligero descenso. **Conclusión:** Se recomienda insertar el programa presentado al entrenamiento convencional de



Descriptores: Entrenamiento de Fuerza; Gimnasia; Lesiones en Deportes.

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0517

Article received on 09/20/2022 accepted on 10/21/2022

INTRODUCTION

Aerobics is a sports event based on the body and mainly participating in aerobic exercise. The aim is to shape the body and improve health through body movement. Aerobics is a sport with high participation of the masses in China.¹ It has a strong inclusiveness. Aerobics can adjust the difficulty of sports according to different ages and different types of participating groups. At the same time, aerobics projects do not have too many requirements for venues and facilities. Aerobics is helpful in shaping body, reducing weight, improving coordination and improving body function. Since the long-term development of the project, aerobics has developed from fitness to competitive competition.² With the increase of competition, the intensity of daily training also increases. In this way, the consequences of various sports injuries can not be avoided. We should understand the characteristics of various sports injuries and find out the causes of injuries. To take targeted preventive measures against sports injury.³ For Aerobics projects, we should first check whether our physical condition is suitable for participating in the project. In case of illness and other reasons, treatment shall be carried out first, and participation shall be carried out after the body recovers to meet the project participation standards.⁴ For the groups that have joined the project, we should pay attention to strength training. Scientific strength training can not only improve physical function, but also effectively prevent various sports injuries. The coach shall formulate a scientific strength training plan for the students and update the training contents in time. Professional strength training can improve the performance of the project and effectively prevent sports injury.⁵ It is very important for the protection of project talents to prevent sports injuries and protect sports talents. In this way, it has a very positive effect on the development of aerobics.

METHOD

If we want to discuss the preventive effect of strength training on Aerobics injury, we should analyze the current situation of Aerobics injury. Therefore, before the beginning of the experiment, a basic questionnaire survey was conducted for two purposes: first, to clarify the current situation of sports injury in aerobics, and second, to recruit volunteers and screen the research objects.

The basic survey design adopted the method of questionnaire survey, and distributed and recovered the questionnaires to the students of Aerobics specialty and aerobics loving clubs in several colleges and universities in a city. The questions mainly focused on two points, the type of sports injury and the location of the sports injury.

In the basic questionnaire survey, the author also inquired whether the respondents were willing to serve as experimental volunteers. On the premise of obtaining the knowledge and consent of the other party, 40 athletes who have suffered from sports injuries but have recovered from minor injuries were selected as the study subjects. The performance levels of these 40 athletes belong to several different intervals. The study and all the participants were reviewed and approved by Ethics Committee of Shandong Sport University (NO. 20SDSU521-TF). According to the method of random sampling, they are divided into the experimental group and the control group. The number of athletes in each interval

is divided equally, so that the overall performance structure of the two groups of athletes is basically the same, with 20 people in each group.

This project has designed a set of strength training for different situations, including upper limbs, trunk and lower limbs. Each strength training includes static and dynamic situations.

The actual duration of this experiment is 8 weeks, and the athletes in the experimental group will carry out exercise training three times a week. With the help of teachers, the athletes in the experimental group will carry out practical training on these strength training programs. The exercise principle of the control group is to carry out general physical strength training based on running. In order to reduce the interference of irrelevant variables as much as possible, the daily routine of the experimental group and the control group remained basically the same within 8 weeks. The duration of sports training was the same, and there was no additional training or suspension of training. In addition, the athletes in the experimental group and the control group should pay attention to the stretching before training and the relaxation after training. The physical education teachers should also pay more attention to scientifically control the exercise intensity and prevent sports injury. Finally, during the 8-week period, the experimental group and the athletes basically kept healthy, and there was no drug taking. Before and after the exercise training, seven indexes were tested, such as squat test, hurdle frame, front and back split leg squat, shoulder joint flexibility, straight leg lifting, trunk stable push ups, and rotational stability. Their FMS scores were compared and collected, and the data were collated and analyzed.

RESULTS

Current situation of sports injury in Aerobics

In the previous investigation, the common types of Aerobics injuries are shown in Figure 1.

It can be seen from Fig. 1 that the current aerobics injury situation shows a clear ladder phenomenon. Among them, the four kinds of injuries that are more common and account for more than 70% are muscle injury, tendon and ligament injury, joint injury and bursa injury. These injuries are often caused by the athletes' lack of preparation activities. The pain is relatively serious in a short time. However, as long as timely treatment and scientific recuperation are carried out, they can be completely cured and have little impact on future life. The

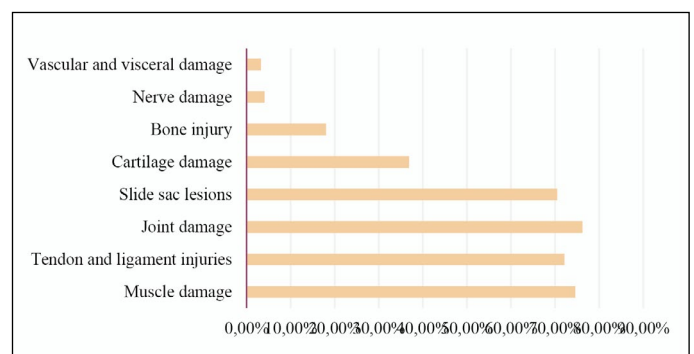


Figure 1. Common types of Aerobics injuries.

injury types in the second stage were bone injury and cartilage injury (18.03% and 36.89% respectively).

It can be seen from Figure 2 that the frequently occurring parts of sports injuries are all over the limbs and core areas, among which the ankle is the most common, followed by the shoulder and waist, and then the elbow and knee joints. This shows that the waist and the joints of the limbs are the most vulnerable to injury in aerobics. Therefore, when strength training is used to prevent aerobics injury, it is necessary to purposefully start with the upper limbs, trunk and lower limbs to exercise their dynamic and static strength.

Role of strength training in preventing aerobics injury

As shown in Table 1, the results of the two groups before the experiment are compared. It can be seen from the table that the scores of the experimental group and the control group fluctuate from 1.5 points to 2.2 points, belonging to the situation where the relevant actions can be completed but there is instability. This indicates that there are certain technical defects in the research objects themselves, and they can not complete the required basic actions in a standard and stable manner. During the test, they can only complete the actions that reduce the difficulty or reluctantly complete the relevant actions. Therefore, their sports injury risk is relatively high. This is also related to the selection of research objects in this paper. The research objects selected in this paper are all athletes and aerobics students who have suffered certain sports injuries but have recovered. Therefore, their sports injuries also prove that they do have certain defects and need to carry out effective scientific exercises.

It can be seen from Table 2 that, after the experiment, the scores of the experimental group, except for the shoulder joint, are all above 2.3, belonging to a high score range. The corresponding situation is that they can basically complete the relevant tests well, and can play a stable role in the exercise process, and the exercise meets the standard. In the prediction of corresponding sports injury, the probability of sports injury is also greatly reduced. The score of the control group is still in the range of 1.5-2.2, and some indicators even fall below one point, indicating that the control group's movement stability is poor, the standard is not enough, and there is a high risk of sports injury.

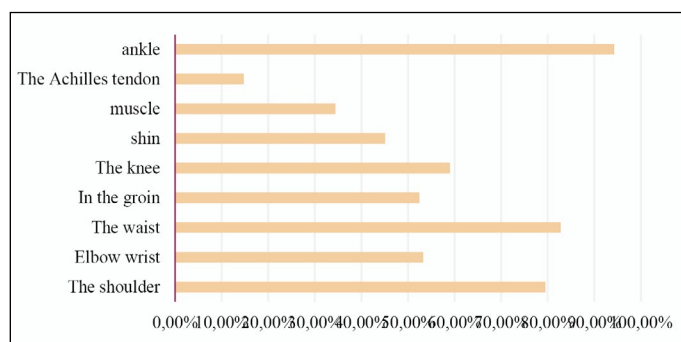


Figure 2. Common occurrence positions of Aerobics injuries.

Table 1. Comparison of FMS scores between the experimental group and the control group before the experiment.

| Test movement | Test group | Control group | t | P |
|---------------------------------|--------------|---------------|---------|-------|
| Squat test | 2.030 ±0.759 | 2.230 ±0.640 | -0.5002 | >0.05 |
| Cross -rail | 2.114 ±0.715 | 1.982 ±0.780 | 0.7263 | >0.05 |
| Squatting on the front and rear | 1.841 ±0.725 | 1.839 ±0.817 | 0.0010 | >0.05 |
| Shoulder joint flexibility | 1.548 ±0.877 | 1.519 ±0.953 | 0.1886 | >0.05 |
| Straight legs up | 1.910 ±0.688 | 1.849 ±0.664 | 0.5414 | >0.05 |
| Stable push -ups of trunk | 1.725 ±1.044 | 1.964 ±1.144 | -0.4910 | >0.05 |
| Rotation stability | 1.618 ±0.867 | 1.660 ±0.709 | 0.0010 | >0.05 |

Table 2. Comparison of FMS scores between the experimental group and the control group after the experiment.

| Test movement | Test group | Control group | t | P |
|---------------------------------|--------------|---------------|--------|-------|
| Squat test | 2.592 ±0.423 | 2.292 ±0.561 | 1.9885 | <0.05 |
| Cross -rail | 2.789 ±0.397 | 1.920 ±0.729 | 4.6476 | <0.05 |
| Squatting on the front and rear | 2.343 ±0.511 | 1.982 ±0.787 | 1.8756 | <0.05 |
| Shoulder joint flexibility | 1.797 ±0.641 | 1.579 ±1.022 | 0.8129 | >0.05 |
| Straight legs up | 2.333 ±0.506 | 1.788 ±0.695 | 3.0164 | <0.05 |
| Stable push -ups of trunk | 2.395 ±0.797 | 0.820 ±1.001 | 1.9854 | <0.05 |
| Rotation stability | 2.352 ±0.611 | 1.589 ±0.945 | 2.7961 | <0.05 |

DISCUSSION

The purpose of training is to improve the physical quality in an all-round way. Physical quality is multifaceted. We should first learn relevant knowledge of vulnerable parts of the body. Choose strength training with different intensity according to your own situation. In the training link, it is necessary to clearly improve the strength training of joints and core muscle groups. To improve the toughness of soft tissue and prevent sports injury. Strength training is conducted in the mode of increasing intensity. With the help of professional auxiliary equipment, avoid blind training. Ask the coach in real time whether the training action is accurate. Avoid inefficient training caused by irregular training. It is easy to suffer from sports injuries in the training process due to the wrong force of the self energizing muscle group. Therefore, coaches should correct the mistakes in the training of students in time. During the training process, it is necessary to prevent the training in the fatigue state or the injured state. After a certain amount of training, students' physical strength level will drop. Students with relatively weak physical quality may even be exhausted. Therefore, the training process should be properly adjusted, or through a period of rest. Avoid fatigue and injury training. In strength training, the choice of venue is particularly important. The professional aerobics training ground should choose the ground with small friction and flexibility for training as much as possible. For the project equipment, we should also make a good choice to avoid inefficient training caused by low equipment comfort. And even bring hidden dangers of sports. Pay attention to warm-up before the start of the training session to keep your body in an active state. In the active state, people's reaction ability and physical function are at the peak. It can make sports training more efficient and can effectively avoid some soft tissue injuries in sports.

Reducing sports injury through strength training is an important research topic of modern competitive sports. The purpose of training is to improve the tissues and muscles of all parts of the body. According to the characteristics of aerobics, we choose targeted training. Form a unique training system suitable for aerobics. Improve students' body control ability by improving their body muscle mass. The increase in the amount of muscle around the soft tissue is conducive to the protection of vulnerable parts such as joints and ligaments when they are energized. Increasing your muscle mass can improve your basic metabolic level. People's endurance has an important relationship with their own metabolism. Therefore, strength training indirectly affects the improvement of students' endurance level. Moreover, good endurance is an important factor to avoid sports injuries in competitive sports. Muscle training is also important for students' nervous system. Keeping the nervous system active can make students in the best exercise state. Many types of sports injuries are due to the nervous system is not in an active state, resulting in inadequate response. It is also important to educate students on theoretical knowledge, which can help students make decisive judgments in different unexpected situations. Reduce the degree of injury caused by sports accidents. Therefore, high-intensity

strength training combined with advanced theoretical knowledge can effectively prevent students from sports injuries during aerobics. The improvement of strength has effectively reduced the hard injury, soft tissue sprain and strain caused by the impact. Coaches should also strengthen the study of strength training related knowledge to provide a basis for guiding students. Through training and guidance, students' sports safety can be protected and their sports state can be effectively prolonged. Indirect protection of Aerobics talents is conducive to the development of Aerobics projects.

CONCLUSION

In the current aerobics teaching, there are some difficult aerobics actions, which are easy to cause students' sports injury. Therefore, how to reduce the sports injury in aerobics training is the concern of many physical education teachers. The functional strength training proposed

in this paper combines the parts that are easy to occur in sports injury, strengthens training, improves muscle strength and joint flexibility, and enhances the stability of athletes in the process of aerobics. Compared with traditional strength training, it has higher advantages in sports injury prevention. Therefore, in the aerobics training, we should introduce the sports program proposed in this paper and improve it according to the actual situation of the athletes, so as to protect the physical health of the athletes and improve their competitive level.

ACKNOWLEDGEMENTS

This paper was supported by: Ministry of Education Humanities and Social Sciences Research Project - Youth Fund Project, No. 13YJC880099.

The author declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: This paper was supported by: Ministry of Education Humanities and Social Sciences Research Project - Youth Fund Project, No. 13YJC880099.

REFERENCES

1. Zhang AH. From aerobics training and competitions to see the status of development of aerobics in China and countermeasures. *Advanced Materials Research*. 2014;926-30:4158-61.
2. Shepelenko TV, Cieřlicka M, Prusik K, Muszkieta R, Sobko IN, Ryepko OA, et al. Factorial structure of aerobics athletes' fitness. *Pedagog Psychol Med-Biol Probl Phys Train Sports*. 2017;21(6):291-300.
3. Finch C. A new framework for research leading to sports injury prevention. *J Sci Med Sport*. 2006;9(1-2):3-9.
4. Caine D, Maffulli N, Caine C. Epidemiology of injury in child and adolescent sports: injury rates, risk factors, and prevention. *Clin Sports Med*. 2008;27(1):19-50.
5. Koutedakis Y, Hukam H, Metsios G, Nevill A, Giakas G, Jamurtas A, et al. The effects of three months of aerobic and strength training on selected performance-and fitness-related parameters in modern dance students. *J Strength Cond Res*. 2007;21(3):808-12.