CONTROL OF JOINT INJURIES IN AEROBIC GYMNASTS

CONTROLE DE LESÕES ARTICULARES EM GINASTAS AERÓBICOS

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Xiaomin Zhang[1]
(Physical Education Professional)

1. Xinjiang University of Political Science and Law, Department of Basic Education, Xinjiang, Tumushuke, China.

Correspondence:
Xiaomin Zhang
Xinjiang, Tumushuke, China.
843900.
Xiaomin20zhang@163.com

ABSTRACT

Introduction: Joint injuries are a common problem in aerobic gymnastic athletes due to the particularities of this sport. Therefore, the method of controlling and preventing joint injuries in athletes has become an important focus of current research. Objective: Study a post-training prevention protocol for joint injuries in aerobic gymnasts. Methods: The experiment lasted 8 weeks, in which 10 athletes from the control group performed a traditional stretching recovery protocol. In contrast, the experimental group performed rehabilitation training through previously defined suspension training. The stability and flexibility of the athletes' lumbar and ankle joints were recorded and compared before and after the beginning of the experimental training. Results: The suspension training proposed in this paper can optimize the static balance parameters of the athletes' joints, improving stability and promoting joint injury control. Conclusion: The scheme proposed in this paper may help athletes to control joint injuries, improve dysfunction of the musculoskeletal system, reduce interference from sports injuries, and help them to perform better in the field. **Level of evidence II; Therapeutic studies - investigating treatment outcomes.**

Keywords: Gymnastics; Athletic Injuries; Exercise Therapy.

RESUMO

Introdução: Danos articulares são um problema comum nos atletas de ginástica aeróbica devido às particularidades desse esporte. Portanto, o método de controle e prevenção de lesões articulares dos atletas tornou-se um foco importante das pesquisas atuais. Objetivo: Estudar um protocolo de prevenção pós-treino para lesões articulares em ginastas aeróbicas. Métodos: O experimento durou 8 semanas, nas quais 10 atletas do grupo de controle executaram um protocolo de recuperação por alongamento tradicional, enquanto o grupo experimental realizou o treinamento de reabilitação através de um treino com suspensão previamente definido. A estabilidade e flexibilidade das articulações lombares e tornozelos dos atletas foram registradas e comparadas antes e depois do início do treinamento experimental. Resultados: O treinamento em suspensão proposto neste trabalho pode otimizar os parâmetros de equilíbrio estático das articulações dos atletas, melhorando a estabilidade e promovendo o controle das lesões articulares. Conclusão: O esquema proposto neste trabalho pode ajudar os atletas a controlarem as lesões articulares, melhorar a disfunção do sistema musculoesquelético, reduzir a interferência de lesões esportivas e ajuda-los a obter um desempenho melhor em campo. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Ginástica; Traumatismos em Atletas; Terapia por Exercício.*

RESUMEN

Introducción: Las lesiones articulares son un problema común en los atletas de gimnasia aeróbica debido a las particularidades de este deporte. Por lo tanto, el método de control y prevención de las lesiones articulares en los deportistas se ha convertido en un importante foco de investigación actual. Objetivo: Estudiar un protocolo de prevención post-entrenamiento de lesiones articulares en gimnastas aeróbicos. Métodos: El experimento duró 8 semanas, en las que 10 atletas del grupo de control realizaron un protocolo de recuperación mediante estiramientos tradicionales, mientras que el grupo experimental realizó un entrenamiento de rehabilitación mediante un entrenamiento en suspensión previamente definido. Se registraron y compararon la estabilidad y la flexibilidad de las articulaciones lumbares y del tobillo de los atletas antes y después del inicio del entrenamiento experimental. Resultados: El entrenamiento en suspensión propuesto en este trabajo puede optimizar los parámetros de equilibrio estático de las articulaciones de los deportistas, mejorando la estabilidad y favoreciendo el control de las lesiones articulares. Conclusión: El esquema propuesto en este trabajo puede ayudar a los deportistas a controlar las lesiones articulares, mejorar la disfunción del sistema musculoesquelético, reducir la interferencia de las lesiones deportivas y ayudarles a obtener un mejor rendimiento en el campo. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Gimnasia; Traumatismos en Atletas; Terapia por Ejercicio.*

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INTRODUCTION

Aerobics is a kind of sports event that the joints of the whole body participate in sports and express through body movements. The body is the foundation of aerobics, and the participation of aerobics is high.[1] Aerobics projects have a large range of age-appropriate people, and the difficulty of Aerobics projects can be changed according to the age of the participating groups. Therefore, aerobics is a very inclusive sport. Secondly, the aerobics project has no special requirements for the venue.[2] Therefore, the participation of the project is very high, and it is loved by sports groups. Aerobics can help students shape their bodies, improve their physical functions, and improve their coordination and stability. Moreover, aerobics has more benefits for the weight loss group.[3] The aerobics project has developed from the original physical fitness project to a competitive sports project. The intensity of daily training is also increased. The theoretical knowledge of the project is more advanced under the research of professionals. In order to achieve the goal of improving their performance, students put in more training time. While the training time increases, it also increases the hidden danger of sports injury. In aerobics training, sports joint injury is the most likely type of sports injury in training.[4] The recovery period of joint injury is long, and it is easy to cause secondary injury. The recovery of joint injury is not complete, and it is easy to end the sports career of the project in advance.[5] Therefore, the research on rehabilitation of joint injuries is also an important part of Aerobics related research. Doing a good job in sports rehabilitation of joint injury is beneficial to protecting the sports talents in aerobics. Provide basic support for the development of aerobics.[6] Therefore, this paper takes the athletes who have suffered sports injuries as the research object to explore the effect of rehabilitation training on the recovery of athletes' injured joints.

METHOD

Ankle joint injury is a common type of Aerobics injury. It has a high frequency and can be cured through certain effective treatment, with fewer sequelae. Therefore, in the selection of research objects, 20 volunteers were selected from 32 Aerobics athletes with ankle joint injuries as the research objects, and their basic conditions were not different. The study and all the participants were reviewed and approved by Ethics Committee of Xinjiang University of Political Science and Law (NO.21XJUPSL-BU20). The degree of sports injury is basically the same. The experimental group and the control group are grouped by random sampling. The basic information is shown in Table 1 ($P > 0.05$), indicating that there is no significant difference.

The experiment lasted for 8 weeks, in which 10 athletes in the control group exercised according to the existing stretching recovery mode, while the experimental group performed rehabilitation training through set suspension training. Set suspension training can keep the athletes in an unstable state all the time, so as to stimulate the coordination and contraction ability of trunk muscles and limb muscles, improve the function of musculoskeletal system, not only enhance the core stability, but also enhance the flexibility of athletes, reduce muscle pain and alleviate sports injury.

At present, the experimental group and the control group were trained three times a week for a total of 8 weeks. In addition, the routine and diet of the experimental group and the control group were basically the same in daily life, and there were no additional injuries or other sports injuries during the whole experimental process, and no drugs that would affect the physical state were taken.

Before and after the beginning of the experimental training, the stability and flexibility of the athletes' joints were recorded and compared. There are two purposes in joint selection. First of all, athletes, especially Aerobics athletes, will have some discomfort in the lumbar joints to prove the adjustment effect of rehabilitation training on the slight sports injury area. Subsequently, the ankle joints that are uncomfortable in the athletes themselves are selected, and the recovery effect of rehabilitation training on sports injury is analyzed by comparing with the normal joints.

The obtained data were sorted and analyzed, and the p value was calculated. If $P > 0.05$, there is no significant difference; if $P < 0.05$, there is a significant difference; if $P < 0.01$, there is a very significant difference.

Table 1. Analysis of the basic situation of the research object.

Options	Experience group	Control group
Age	23.091±2.172	23.585±2.437
Height (cm)	176.335±4.697	170.790±6.019
Weight (kg)	63.972±8.414	170.012±7.170
BMI	2,135.435±2.506	2201.551±190.452

RESULTS

Joint injury of Aerobics Athletes

As shown in Figure 1, the joint injuries of Aerobics Athletes in training obtained from the questionnaire survey. Through investigation and analysis, it can be seen that after the start of aerobics, athletes need to carry out a series of leg movements, which brings great pressure to the ankle and knee joints. If they do not do well in stretching activities or the movements are too intense, they will cause joint injuries to the ankle and knee joints. In the process of aerobics, the hand needs to undertake some activities to support the ground, so the wrist joint is also one of the parts prone to sports injury. Finally, in the exercise process of Aerobics athletes, the waist is always the strongest part of the force. When the movement is not standardized or the exercise intensity is too large, beyond the acceptable range, it will lead to joint injury in the waist of the athletes.

Effect of rehabilitation training on lumbar joints

The protection of lumbar joints is a key point that athletes must pay attention to in the process of sports. Therefore, this experiment also discusses the soothing effect of existing rehabilitation training on lumbar discomfort. As shown in Table 2, six changes of joints in the core part, i.e. left rotation, right rotation, forward flexion, backward extension, left flexion and right flexion, were selected to analyze the changes before and after.

It can be seen from table 2 that in the experimental group, the left--hand rotation amplitude increased from (119.130 ± 2.447) nm to (161.070 ± 8.655) nm after the experiment, the right-hand rotation amplitude increased from (119.544 ± 36.478) nm to (160.976 ± 50.771) nm after the experiment, the forward flexion amplitude increased from (241.070 ± 80.235) nm to (283.605 ± 74.110) nm after the experiment, and the backward extension amplitude increased from (219.069 ± 80.820) nm to

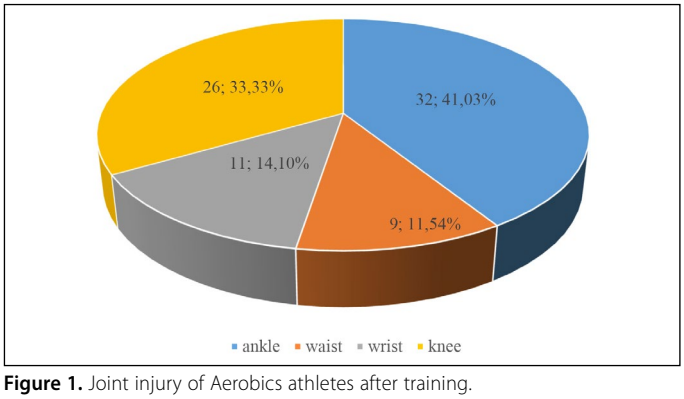

Figure 1. Joint injury of Aerobics athletes after training.

Table 2. Changes of joints in core parts of athletes after rehabilitation training.

Options	Control group		Experience group	
	Before experiment	After the experiment	Before experiment	After the experiment
Left-handed (nm)	122.713±48.423	127.225±43.203	119.130±2.447	161.070±8.655
Right handed (nm)	123.211±46.707	131.008±39.967	119.544±36.478	160.976±50.771
Forward Bend (nm)	238.889±83.586	253.226±82.159	241.070±80.235	283.605±74.110
Back extension (nm)	222.721±86.091	233.973±80.707	219.069±80.820	287.834±76.623
Left flexion (nm)	99.520±57.575	113.088±55.559	104.774±4.230	148.321±0.793
Right flexion (nm)	119.031±35.358	124.065±41.800	120.424±41.533	151.181±39.003

(287.834 ± 76.623) nm after the experiment, The left flexion amplitude increased from (104.774 ± 4.230) nm to (148.321 ± 0.793) nm after the experiment, and the right flexion amplitude increased from (120.424 ± 41.533) nm to (151.181 ± 39.003) nm after the experiment. The control group also improved the changes of the six directions of the lumbar joints before and after the experiment, but the range of improvement was much smaller than that of the experimental group. This shows that the suspension rehabilitation method proposed in this paper has a better effect on the optimization and adjustment of the existing joints than the traditional stretching exercise training.

Effect of rehabilitation training on injured ankle joint

In this section, the influence of rehabilitation training on the existing injured ankle joints of athletes is discussed. As shown in Table 3, the joint damage of the experimental group and the control group is compared, that is, the damaged joint is compared with the other joint of the same person that is not damaged. Through the comparison of the same person, the current damage can be more effectively analyzed, and the sound joint data can also be used as an indicator of judgment.

It can be seen from Table 3 that the ankle joint injuries of the two groups of athletes are relatively serious. The data of the injured joints are far higher than that of the healthy joints in the three indexes of the front and rear axial static parameters, the left and right axial static parameters and the overall static parameters. Therefore, effective rehabilitation training is required to treat and adjust.

Table 4 shows the scores of three parameter indexes before and after the experiment of the injured joints of athletes. It can be seen from the table that the axial static parameters before and after the control group decreased from (2.569 ± 0.478) ° to (2.309 ± 0.476) ° after the experiment, which was higher than that of healthy joints (2.100 ± 0.664) °; The left and right axial static parameters decreased from (3.517 ± 0.638) ° to (2.429 ± 0.395) ° after the experiment, which was higher than that of healthy joints (2.220 ± 0.618) °; The overall static parameters decreased from (3.807 ± 0.734) ° to (2.805 ± 0.736) ° after the experiment, which was higher than that of healthy joints (2.686 ± 0.368) °. Although after 8 weeks of training, the data has been significantly reduced, but it is still high compared with healthy joints. This shows that the traditional stretching training method is effective for the rehabilitation of athletes' joints, but it can not recover to the original health level.

The axial static parameters of the experimental group decreased from (2.569 ± 0.489) ° to (2.160 ± 0.469) ° after the experiment, which was higher than that of the healthy joint (2.030 ± 0.734) °; The left and right axial static parameters decreased from (3.493 ± 0.624) ° to (2.647 ± 0.605) ° after the experiment, which was higher than that of healthy joints (2.389 ± 0.525) °; The overall static parameters decreased from (3.807 ± 0.734) ° to (2.725 ± 0.754) ° after the experiment, which was lower than that of healthy joints (2.863 ± 0.571) °.

Table 3. Joint damage in the experimental group and the control group.

Options Front and rear axial static parameters (°)	Control group		Experience group	
	Healthy joints	Before experiment	Healthy joints	Before experiment
Left and right axial static parameters (°)	2.100±0.664	2.569±47.772	2.030±0.734	2.569±0.489
Overall static parameters (°)	2.220±0.618	3.517±0.638	2.389±0.525	3.493±0.624
Options	2.686±0.368	3.807±0.734	2.863±0.571	3.807±0.734

Table 4. Changes of static balance parameters of athletes' joints after rehabilitation training.

Options Front and rear axial static parameters (°)	Control group		Experience group	
	Before experiment	After the experiment	Before experiment	After the experiment
Left and right axial static parameters (°)	2.569±0.478	2.309±0.476	2.569±0.489	2.160±0.469
Overall static parameters (°)	3.517±0.638	2.429±0.395	3.493±0.624	2.647±0.605
Options	3.807±0.734	2.805±0.736	3.807±0.734	2.725±0.754

DISCUSSION

When joint injury occurs after aerobics training, the movement of the injured joint should be stopped immediately. If there is bleeding, stop bleeding in time. It shall be combined with cold compress to reduce swelling to reduce swelling of the injured part. Stopping the movement of the injured part can effectively reduce the bleeding or edema of the injured tissue. After emergency treatment, ask the doctor for advice in time to avoid blind self judgment and secondary joint injury. In the middle stage of recovery of joint injury, the swelling part gradually dissipates. At this time, the doctor should be actively inquired whether physiotherapy, massage, acupuncture and other methods can be used to cooperate with the treatment. Speed up the recovery of the injured part. In the late stage of recovery from joint injury, most of the injured joint tissues have been completely recovered, but the joint function has not been fully recovered. At this time, we should continue to cooperate with the drug treatment to maintain the fixed state of the injured joint and avoid the force of the injured joint until it is completely recovered. During the rehabilitation period, students should ensure reasonable work and rest habits and sufficient sleep time, which is conducive to the rapid recovery of the injured part. Reasonable eating habits: during the recovery period, ask the doctor for advice, formulate the diet diet for the recovery period, and supplement various nutrients required for the recovery period. Reasonable work and rest and reasonable diet are important auxiliary means for joint injury recovery.

CONCLUSION

The sports injury of athletes has always been an important problem that puzzles athletes and coaches. Sports injury is inevitable. So how to adopt effective rehabilitation training methods to not only help the injured joints recover as soon as possible, but also optimize the existing undamaged joints to prevent the occurrence of sports injury is a problem that has been studied at present. The set suspension training method proposed in this paper can better adjust the two problems raised in this paper, and carry out targeted rehabilitation training on the damaged joints, so as to improve the stability and flexibility of the knee joint. During the whole training process, the core muscle strength of the

athletes will also be exercised, so that the core parts of the athletes are more flexible and the possible sports injuries in the sports process are reduced. Therefore, the scheme proposed in this paper can help athletes recover the damaged parts as soon as possible, optimize the strength of other joints and muscles, improve the flexibility of joints, improve the dysfunction of musculoskeletal system, reduce the interference of sports injuries to athletes, and help athletes play better on the field.

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REFERENCES

1. Miletić D, Katić R, Maleš B. Some anthropological factors of performance in rhythmic gymnastics novices. Coll Antropol. 2004;28(2):727-37.
2. Di Cagno A, Baldairi C, Battaglia C, Brasili P, Merni F, Piazza M, et al. Leaping ability and body composition in rhythmic gymnasts for talent identification. J Sports Med Phys Fitness. 2008;48(3):341-6.
3. Sterkowicz-Przybycień K, Sterkowicz S, Biskup L, Zarów R, Kryst Ł, Ozimek M. Somatotype, body composition, and physical fitness in artistic gymnasts depending on age and preferred event. PLoS One. 2019;14(2):1-21.
4. Hunt KJ, Hurwit D, Robell K, Gatewood C, Botser IB, Matheson G. Incidence and Epidemiology of Foot and Ankle Injuries in Elite Collegiate Athletes. Am J Sports Med. 2017;45(2):426-33.
5. Fong DT, Hong Y, Chan LK, Yung PS, Chan KM. A systematic review on ankle injury and ankle sprain in sports. Sports Med. 2007;37(1):73-94.
6. Debien PB, Oliveira PM, Ferreira T. Training load, recovery and injuries in elite rhythmic gymnasts during main competitive periods: a case study. Sci Gymnast J. 2020;12(3):277-85.