PROBLEMS AND STRATEGIES FOR THE PREVENTION OF ANKLE INJURIES IN SOCCER

PROBLEMAS E ESTRATÉGIAS PARA A PREVENÇÃO DE LESÕES DO TORNOZELO NO FUTEBOL

PROBLEMAS Y ESTRATEGIAS PARA LA PREVENCIÓN DE LESIONES DE TOBILLO EN EL FÚTBOL

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ABSTRACT

Introduction: The most significant reasons for the frequent ankle injuries in soccer players are the great rivalry and the multiple efforts required by the sport. Objective: Explore the actual scenario of sports injuries in the ankle joint in soccer players, raising adequate prevention strategies. Methods: 22 professional soccer players were randomly divided into experimental and control groups. A controlled experiment lastingsix6 weeks was developed. The experimental group added complementary ankle training in the daily training, while the control group had no changes, according to the usual training plan. Rear (PL) and frontal (AT) balance indexes, functional movement assessment (FMS,) and ankle injury cause (CAI) were collected, analyzed, and compared before and after the intervention. Results: After training, the experimental group's PL score increased from 106.81±5.33 to 117.69±6.44; AT score increased from 61.94±6.17 to 70.36±5.37; CAI score increased from 22.33±3.58 to 25.38±3.18. Total FMS test score increased from 15.36±1.38 to 18.84±1.99, with trunk flexions standing out (from 2.10±0.43 to 2.57±0.37). On the other hand, the changes in the control group were not statistically significant. Conclusion: The presented complementary ankle training effectively prevented injuries in soccer players and can be applied to reduce sports complications in players in training. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Soccer; Ankle Injuries; Sports Injuries; Preventive Care.

RESUMO

Introdução: As razões mais significativas para as frequentes lesões no tornozelo em jogadores de futebol são a grande rivalidade e os múltiplos esforços requisitados pelo esporte. Objetivo: Explorar o quadro atual das lesões esportivas na articulação do tornozelo em jogadores de futebol, levantando estratégias de prevenção adequadas. Métodos: Um total de 22 jogadores profissionais de futebol foram divididos aleatoriamente em grupo experimental e de controle. Um experimento controlado com duração de 6 semanas foi desenvolvido. No treinamento diário, o grupo experimental acrescentou um treinamento complementar do tornozelo, enquanto o grupo de controle não teve alterações, de acordo com o plano de treinamento habitual. Foram coletados, analisados e comparados os índices de equilíbrio traseiro (PL) e frontal (AT), a avaliação funcional do movimento (FMS) e a causa das lesões no tornozelo (CAI) antes e após a intervenção. Resultados: Após o treinamento, a pontuação PL do grupo experimental aumentou de 106,81±5.33 para 117,69±6.44; a pontuação AT aumentou de 61.94±6.17 para 70,36±5,37; a pontuação CAI aumentou de 22,33±3,58 para 25,38±3,18. A pontuação total do teste FMS aumentou de 15,36±1,38 para 18,84±1,99, destacando-se as flexões do tronco (de 2,10±0,43 para 2,57±0,37). Por outro lado, as alterações do grupo controle não foram estatisticamente significativas. Conclusão: O treinamento complementar para o tornozelo apresentado mostrou-se eficaz na prevenção de lesões em jogadores de futebol e pode ser aplicado para reduzir as complicações esportivas dos jogadores em treinamento. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Futebol; Lesões do Tornozelo; Lesões Esportivas; Cuidado Preventivo.*

RESUMEN

Introducción: Las razones más significativas de las frecuentes lesiones de tobillo en futbolistas son la gran rivalidad y los múltiples esfuerzos que requiere este deporte. Objetivo: Explorar el panorama actual de las lesiones deportivas en la articulación del tobillo en futbolistas, planteando estrategias de prevención adecuadas. Métodos: Un total de 22 futbolistas profesionales fueron divididos aleatoriamente en grupos experimental y control. Se desarrolló un experimento controlado de 6 semanas de duración. En el entrenamiento diario, el grupo experimental añadió un entrenamiento complementario del tobillo, mientras que el grupo control no tuvo cambios, según el plan de entrenamiento habitual. Se recogieron, analizaron y compararon los índices de equilibrio posterior (PL) y frontal (AT), la valoración del movimiento funcional (FMS) y la causa de lesión de tobillo (CAI) antes y después de la intervención. Resultados: Tras el entrenamiento, la puntuación PL del grupo experimental aumentó de 106,81±5,33 a 117,69±6,44; la puntuación AT aumentó de 61,94±6,17 a 70,36±5,37; la puntuación CAI aumentó de 22,33±3,58 a 25,38±3,18. La puntuación total del test FMS aumentó de 15,36±1,38 a 18,84±1,99, destacando las flexiones de tronco (de 2,10±0,43 a 2,57±0,37). Por otro lado, los cambios del grupo de control no fueron estadísticamente significativos. Conclusión: El entrenamiento complementario de tobillo presentado

demostró ser eficaz en la prevención de lesiones en futbolistas y puede aplicarse para reducir las complicaciones deportivas en jugadores en formación. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Fútbol; Traumatismos del Tobillo; Lesiones en Deportes; Cuidado Preventivo.*

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INTRODUCTION

Ankle joint is an important weight-bearing joint of human body, and its ligament injury occurs frequently.[1] The most common type of ankle joint injury is the lateral ligament injury of the ankle joint. Its injury probability accounts for a very high proportion among football players. Compared with other types of sports injuries, although ankle joint injuries are not very serious sports injuries, the treatment process is also relatively easy to operate.[2] However, repeated ankle ligament injury will lead to ankle osteoarthritis, which will seriously affect sports training, exercise and daily life. Therefore, it is very important to use appropriate training methods to reduce the recurrence rate of ankle injury.[3,4] Among the causes of ankle injury of football players, the most common causes are resistance injury, inadequate preparation and the stability of the players themselves.[5] Therefore, based on this, this paper designed a control experiment including ankle joint training intervention, which provides some reference for further research on the causes, frequency and related prevention strategies of ankle joint sports injury in football.[6]

METHOD

Experimental object

According to the purpose of the study, through interviews, questionnaires and literature collection, this paper selected a total of 22 professional football players from a sports school in a city as the experimental subjects before the formal start of the experiment. The study and all the participants were reviewed and approved by Ethics Committee of Civil Aviation Flight University of China(NO.CAFUC-PT21Z006). Through prior investigation, it is clear that the selected football players have been training for more than one year, and have no injuries recently, so they are suitable for football training. And the time is sufficient and will not conflict with other course schedules. 22 football players were randomly divided into two groups: the experimental group and the control group. After statistical analysis of the basic conditions of the two groups, it was determined that there was no statistically significant difference between the two groups in age, height, weight and training years (P>0.05), which met the basic requirements of the experiment. The basic information of the subjects is shown in Table 1.

Experimental scheme

In order to study the problem and prevention strategy of ankle injury in football, a 6-week controlled experiment was designed. The football players were randomly divided into the experimental group and the control group. In the daily training, the experimental group added additional ankle training time, while the control group kept the same training plan according to the football training routine. The two groups were trained four times a week, each time for no less than one hour. Each training process is similar, which is divided into three parts: preparation, formal training and relaxation. The difference is that the control group carries out regular football training in the formal training link, mainly including physical training and football skill training. In addition to physical training and football skill training, the experimental group was assisted with ankle joint training. The ankle joint training conducted by the experimental group mainly includes low-order training such as anti-resistance hook foot, anti-resistance stretch foot, anti-resistance ankle varus and high-order training such as valgus, step and balance ball.

Table 1. Basic information of subjects.

Group	Experience group	Control group	P
Age (yr)	22.071±3.882	21.740±3.762	0.691
Body weight (Kg)	70.153±6.481	72.130±7.058	0.787
Height (cm)	175.207±3.721	176.766±3.838	0.804
Years of training (yr)	4.771±3.473	4.524±3.266	0.844

Experimental test

The ankle stability and training effect of the tested athletes are mainly evaluated by measuring the Y balance test score, the CAI ankle instability score and the FMS test score.

The score of Y balance test in this paper mainly includes four indicators, namely AT (front side), PL (rear side), PM (rear inside test) and CS (total score). Before the test, the subjects need to warm up, wear light clothes and stand barefoot on the measuring instrument. The subject stands on the central platform of the test bench with one foot, puts his hands above his hips, and raises one foot to push the test box in different directions according to the relevant instructions. The measurement in each direction shall be repeated for three times, and the tester shall record the maximum distance each time. After three times of straightening, the next index test can be carried out.

The FMS test conducted in this paper mainly includes 8 indicators, namely, total score, deep squat, front and back split squat, hurdle stride, active straight knee lift, shoulder flexibility, rotation stability and trunk stability push up. The test is scored according to 3, 2, 1 and 0. The higher the score is, the more standard the subject's movement is, without instability, pain and other phenomena. A score of 0 indicates pain or failure to complete related actions while performing actions.

Experimental control and equipment

In order to ensure the accuracy of the experimental results in this paper, during the experiment, the subjects should not be absent or late, leave early and other conditions that affect the training. Besides experimental training, there is no extra intense exercise. The daily training and life of the 22 athletes participating in the experiment were carried out in the school, with no significant difference, so as to ensure adequate rest and training time.

In addition to the Y-shaped body dynamic balance tester and the yoga mat used for FMS test, the experimental equipment also includes dumbbells, elastic bands, steps and balance balls for football training and ankle joint training, as well as soccer, knee and wrist pads and other equipment.

RESULTS

Investigation on sports injury of ankle joint in football

Before the beginning of the experiment, all the students in the football professional class of the athletes in this paper were asked to carry out a questionnaire on the sports injury of ankle joint in football. A total of 52 valid questionnaires were left after screening out invalid

and unavailable questionnaires. The results of the investigation on the number of ankle injuries in football are shown in Figure 1.

According to the content shown in Figure 1, the 52 people who filled in the questionnaire have had different degrees of ankle injury. Among them, the proportion of people who have been injured once is the highest, which is 51.92%, a total of 27 people. Secondly, 36.54% of the 19 people had suffered from ankle joint injury twice. At last, 6 people (11.54%) had three ankle injuries. It can be seen that ankle injury is very common among football players, and multiple injuries are also very easy to occur.

While investigating the number of ankle injuries, the questionnaire also conducted relevant research on the causes of ankle injuries of football players, as shown in Figure 2.

From the data in Table 2, it can be seen that among the causes of ankle injury of football players, the proportion of resistance injury and inadequate preparation activities is the highest, 14 and 10 respectively. Secondly, there are three reasons for physical exhaustion and flexibility, lack of sensitivity and difficult technical movements, which are 8, 6 and 5 people respectively. The number of other three reasons, such as inattention, inappropriate sports equipment and external environmental problems, is small. This shows that football, as a sport with strong antagonism and high technical requirements, its own movement mode is an important reason for ankle injury of athletes.

Prevention effect of ankle injury in football

After a six-week control experiment, the Y-balance ability of the tested athletes was tested first. The results are shown in Table 2.

From the data in Table 2, it can be seen that after intervention training, the scores of the four indicators in the experimental group have increased significantly. The increment of PL was the largest, 106.817 ± 5.333 before and 117.697 ± 6.442 after training, with an increment of 10.880. The second is AT, which is 61.943 ± 6.172 before training and 70.363 ± 5.370 after training, with an increase of 8.419. The increment of the other two indicators is small, but the score still shows an increasing trend. The four indicators of the control group also showed different degrees of growth, but the increase was significantly smaller than that of the experimental group. The data in Table 2 can show that regular football training will improve the overall balance ability of athletes, but the effect will be more obvious after the intervention of ankle joint training. This is very important for stabilizing athletes' body balance and reducing ankle joint injuries.

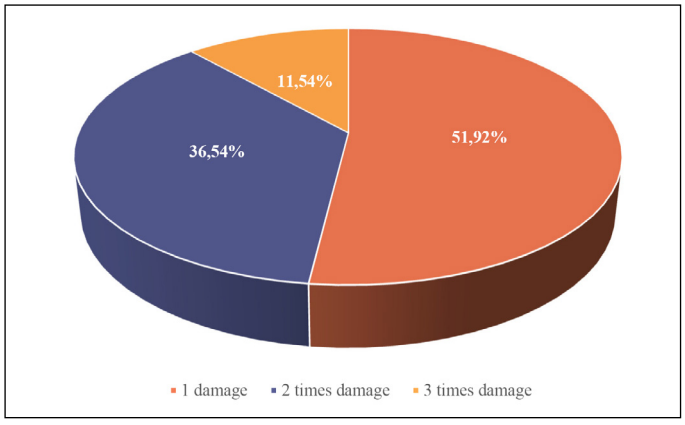

Figure 1. Sports injury of ankle joint in football.

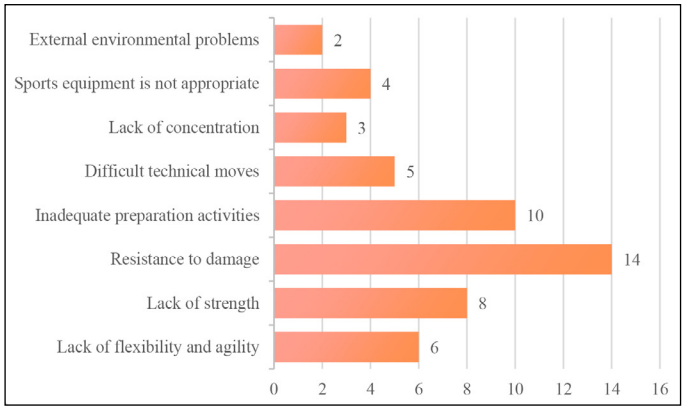

Figure 2. Causes of sports injury of ankle joint in football.

Then the CAI scores of the two groups were statistically analyzed, and the results are shown in Table 3.

Table 3 clearly shows that after the intervention of ankle joint training, the CAI score of the experimental group was significantly improved, the score before training was 22.335 ± 3.589, the score after training was 25.386 ± 3.187, and the increment was 3.051. In the control group, there was only a slight increase, with an increase of 0.259. It further verifies the effectiveness of ankle training intervention in reducing ankle instability, thus further preventing the occurrence of ankle injury.

Finally, the FMS test scores of the two groups of athletes were compared and analyzed, and the results are shown in Table 4.

The data in Table 4 shows that after 6 weeks of intervention training, the FMS test scores of football players in the experimental group have improved to varying degrees. The total score increased significantly, with 15.360 ± 1.389 before training, 18.841 ± 1.993 after training, and 3.481 increment. The increment of trunk stable push-ups is also relatively obvious, with the score of 2.104 ± 0.437 before training, 2.577 ± 0.373 after training, and the increment of 0.472. The increment of other indicators is small, but still shows a growing trend. In contrast, in the control group, except for the obvious increase in the total score of the eight indicators, and the small increase in the two indicators of active straight knee lifting and shoulder flexibility, the scores of other indicators did not change significantly before and after training, and even showed a slight decrease.

DISCUSSION

The research in this paper shows that proper ankle training intervention can not only strengthen and train the stability and coordination of muscles around the ankle, but also effectively prevent the occurrence of ankle injuries. At the same time, it can ensure the quick recovery and function of the sprained joint. The ankle instability caused by the discordance of peripheral nerves and muscles caused by the antagonistic action of football

Table 2. Effect of ankle joint training on Y-balance test score.

Option	AT front side			PL rear outboard		
Time	Before intervention	After intervention	Δ	Before intervention	After intervention	Δ
Control group	62.976±7.233	68.048±4.677	5.071	109.385±7.979	112.778±6.710	3.393
Experience group	61.943±6.172	70.363±5.370	8.419	106.817±5.333	117.697±6.442	10.880
Option	**Internal test after PM**			**CS total score**		
Time	Before intervention	After intervention	Δ	Before intervention	After intervention	Δ
Control group	106.226±7.757	113.060±5.742	6.834	92.517±6.669	98.330±5.624	5.812
Experience group	109.473±7.686	115.189±8.539	5.717	95.046±5.565	100.773±5.393	5.726

Table 3. Effect of ankle joint training on CAI score.

Time	Before intervention	After intervention	Δ
Experience group	22.335 ±3.589	25.386 ±3.187	3.051
Control group	23.866 ±1.727	24.126 ±1.997	0.259

Table 4. Effect of ankle joint training on FMS test score.

Option	Total score			Squat		
Time	Before intervention	After intervention	Δ	Before intervention	After intervention	Δ
Experience group	15.360 ±1.389	18.841 ±1.993	3.481	2.307 ±0.531	2.641 ±0.478	0.334
Control group	15.708 ±1.438	16.367 ±1.707	0.659	2.457 ±0.409	2.534 ±0.328	0.077
Option	**Front and rear split squat**			**Hurdle crossing**		
Time	Before intervention	After intervention	Δ	Before intervention	After intervention	Δ
Experience group	2.005 ±0.366	2.317 ±0.414	0.312	2.124 ±0.366	2.447 ±0.414	0.322
Control group	2.074 ±0.207	2.084 ±0.340	0.010	2.258 ±0.424	2.155 ±0.290	-0.103
Option	**Active straight knee and leg lift**			**Shoulder flexibility**		
Time	Before intervention	After intervention	Δ	Before intervention	After intervention	Δ
Experience group	2.317 ±0.664	2.641 ±0.437	0.324	2.497 ±0.460	2.502 ±0.671	0.005
Control group	2.259 ±0.539	2.360 ±0.774	0.101	2.427 ±0.629	2.544 ±0.536	0.117
Option	**Rotational stability**			**Trunk stable push up**		
Time	Before intervention	After intervention	Δ	Before intervention	After intervention	Δ
Experience group	1.956 ±0.122	1.977 ±0.316	0.022	2.104 ±0.437	2.577 ±0.373	0.472
Control group	1.992 ±0.237	1.952 ±0.330	-0.040	2.289 ±0.385	2.257 ±0.469	-0.032

itself and the lack of flexibility and sensitivity of athletes can be prevented and corrected through ankle function training. In this experiment, after the balance ball training, the strength of the peroneal long and short muscles of the lower limbs of the athletes with unstable ankle joints significantly increased. After the training, the stability of the ankle joints of the athletes with balance ball training significantly improved. Therefore, ankle training including balance board training can be appropriately applied to football training, and become an effective training means to increase the stability of football players' ankle and prevent ankle injury. At the same time, it needs to be combined with regular football training to play a corresponding role in improving football performance.

CONCLUSION

Ankle joint is one of the most important joints in the body. It is the contact point between the body and the ground. It not only has the load-bearing function, but also is the center of the most complex joint force of the body in sports, so it is very vulnerable to injury. Research shows that ankle injury is one of the most vulnerable joints in the body. Ankle joint injury is not a very serious injury, but if not treated correctly in time, it will lead to loss of muscle strength, joint instability and osteoarthritis, affecting normal life and sports. This study compares the effects of general training and ankle training on preventing ankle injury, in order to find suitable and feasible ankle training methods in physical training or teaching training, and put forward suggestions for the rehabilitation of the general population after ankle injury. The experimental results show that ankle joint training is very effective for improving the injured ankle joint, and can be easily completed without special equipment, easy to promote and use, and can be included in the sports and training plan to reduce the incidence of ankle joint injury. It can also be used in the general population to prevent the occurrence of problems such as lateral ligament injury of ankle joint.

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