MOVEMENT TECHNIQUE ANALYSIS AND SPORTS INJURIES PREVENTION IN THE ELDERLY PHYSICAL TRAINING

ANÁLISE TÉCNICA DE MOVIMENTO E PREVENÇÃO DE LESÕES ESPORTIVAS NO TREINAMENTO FÍSICO DE IDOSOS

ANÁLISIS TÉCNICO DEL MOVIMIENTO Y PREVENCIÓN DE LESIONES DEPORTIVAS EN EL ENTRENAMIENTO FÍSICO DE PERSONAS MAYORES

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ABSTRACT

Introduction: Physical training for the elderly is extremely popular. However, there is a lack of analysis on sports injuries in the elderly. Objective: Study the analysis of movement in sports training techniques and preventing sports injuries in the elderly. Methods: Participating in a 15-minute running and warm-up activity before using the standard FMS test kit, they followed seven test movements, each repeated three times; they did so during six weeks of training based on the recommendations for the prevention of sports injuries presented in this paper. Results: Among the 14 elderly subjects with a total FMS score <14 points, most functional motor scores were 15-16 points, of which 19 points were high, and 9 points were low. In the intervention based on the perspective of sports injuries, the FMS measurement value of the elderly was much better than before, and the evaluation of the technical analysis of movement after the correction was significantly higher than before. Conclusion: The prevention of sports injuries proposed in this paper can effectively help the elderly to prevent sports injuries. This paper considers the FMS trial design as an example for analyzing movements in sports training of the elderly and formulating standards. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Education and Training; Athletic Injuries; Accident Prevention.

RESUMO

Introdução: O treinamento físico em idosos é extremamente popular, entretanto, carece de análise sobre as lesões esportivas em idosos. Objetivo: Estudar a análise do movimento nas técnicas de treinamento esportivo e a prevenção de lesões esportivas em idosos. Métodos: Participando de uma atividade de 15 minutos de corrida e aquecimento antes de utilizar o kit de teste padrão FMS, seguiram-se sete movimentos de teste, cada um deles repetidos 3 vezes; fizeram-no durante seis semanas de treinamento com base nas recomendações de prevenção de lesões esportivas apresentadas neste trabalho. Resultados: Entre os 14 sujeitos idosos com pontuação total de FMS <14 pontos, a maioria das pontuações motoras funcionais foram de 15-16 pontos, dos quais 19 pontos foram altos e 9 pontos foram baixos. Na intervenção baseada sob a ótica das lesões esportivas, o valor de medição FMS dos idosos foi muito melhor do que anteriormente, e a avaliação da análise técnica do movimento após a correção foi significativamente maior do que aquela antes da correção. Conclusão: A prevenção de lesões esportivas proposta neste trabalho pode efetivamente ajudar os idosos a prevenir as lesões esportivas. Este documento considera o projeto de ensaio do FMS como um exemplo para analisar os movimentos no treinamento esportivo das pessoas idosas e para formular padrões. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Educação Física e Treinamento; Traumatismos em Atletas; Prevenção de Acidentes.*

RESUMEN

Introducción: El entrenamiento físico en las personas mayores es muy popular, sin embargo, hay una falta de análisis sobre las lesiones deportivas en las personas mayores. Objetivo: Estudiar el análisis del movimiento en las técnicas de entrenamiento deportivo y la prevención de lesiones deportivas en las personas mayores. Métodos: Participando en una actividad de carrera y calentamiento de 15 minutos antes de utilizar el kit de prueba estándar de FMS, se siguieron siete movimientos de prueba, cada uno repetido 3 veces; lo hicieron durante seis semanas de entrenamiento basado en las recomendaciones para la prevención de lesiones deportivas presentadas en este trabajo. Resultados: Entre los 14 sujetos de edad avanzada con una puntuación total de FMS <14 puntos, la mayoría de las puntuaciones motoras funcionales eran de 15-16 puntos, de los cuales 19 puntos eran altos y 9 puntos eran bajos. En la intervención basada en la perspectiva de las lesiones deportivas, el valor de medición de la FMS de los ancianos fue mucho mejor que antes, y la evaluación del análisis técnico del movimiento después de la corrección fue significativamente mayor que antes de la corrección. Conclusión: La prevención de las lesiones deportivas propuesta en este artículo puede

ayudar eficazmente a las personas mayores a prevenir las lesiones deportivas. Este documento considera el diseño de la prueba FMS como un ejemplo para analizar los movimientos en el entrenamiento deportivo de las personas mayores y para formular normas. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Educación y Entrenamiento Físico; Traumatismos en Atletas; Prevención de Accidentes.*

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INTRODUCTION

As an important part of social sports, sports for the elderly is related to the elderly's later life and the stability and harmony of the country. It aims to maintain the health of the elderly, prolong the life of the elderly, enrich cultural life and improve the social spirit. With the aggravation of population aging, the sports of the elderly show the characteristics of increased participation, arbitrariness of sports venues, simplicity of sports items, autonomy of sports time and so on.[1]

At present, more and more old people like sports, and there are more and more old people's sports. However, for the elderly, sports is a double-edged sword.[2] On the one hand, the elderly can improve their health status, reduce the risk of disease, and reduce the pressure of family and society. On the other hand, due to the decline of the physical quality of the elderly, the exercise of the elderly is easy to cause sports injury. Once sports injury occurs, it is easy to aggravate the injury without knowing how to deal with it. The elderly are limited by physical decline, lack of sports knowledge and skills, and lack of professional sports instructors to correct incorrect training methods, which is easy to lead to unnecessary sports injuries and fail to achieve the expected sports goals.[3] Exercise brings not only health but also sports related injuries to the elderly. How to help the elderly exercise safely and minimize the sports injury of the elderly is an urgent problem to be solved. Therefore, this work is carried out on the basis of analyzing the technical actions of physical exercise for the elderly, so as to prevent sports injury and promote physical exercise for the elderly.[4]

METHOD

The research objects are the elderly aged 60-75 who are engaged in physical training in a city, including 50 (38 males and 12 females). The study and all the participants were reviewed and approved by Ethics Committee of Xi'an Physical Education University (NO. 19XNPEUZ06). Before the test, let the subjects understand the task, purpose and significance of the test, and write down their own relevant information. Table 1 shows the basic information of the subjects.

Functional motor screening (FMS) test and evaluation methods are as follows: use the standard FMS test device to run for 15 minutes and warm up before the test, and then test seven actions, including overhead squat, hurdle, straight lunge, shoulder flexibility, active straight knee elevation, stable upper body pushups and trunk rotation stability. Each action is repeated 3 times. The video files were evaluated in sagittal and coronal planes according to the evaluation criteria of testers with FMS Ivevel certificate.

RESULTS

FMS score of sports injury of the elderly in a community

Functional exercise screening includes seven exercise tests and three exclusion tests. The seven test exercises are top squat, hurdle step, straight lunge, shoulder flexibility, active straight knee lift, trunk stability push ups and trunk rotation stability. Among them, hurdle step, shoulder flexibility, active straight knee leg lifting and trunk rotation stability should be tested on the left and right respectively. Additional tests are required for shoulder flexibility, trunk stability push ups, and trunk rotation stability. The maximum score of each test action is 3 points, and the total score is 21 points. If the subject has experienced three exclusion tests or physical pain during the test, the corresponding test score is 0. The total score of functional exercise screening for the elderly in a city is shown in Figure 1.

It is mentioned in the literature that subjects with a total FMS score of less than 14 will suffer sports injury. Figure 1 shows 14 people whose total score is less than or equal to 14. Most of the subjects' estimates of functional movement are between 15 and 16, with the highest score of 19 and the lowest score of 9. The test results show that the total score of the elderly in a city is generally not high, which indicates that the quality and degree of exercise completion are low and prone to sports injury.

FMS score after using the sports injury prevention opinions in this paper

Functional exercise was screened for six weeks according to the guidelines for the prevention of sports injury introduced in this paper, and the effectiveness of the intervention training plan was tested based on the post test data. The average score before training was 12.4 and the median after training was 19.1. The score increased significantly after intervention training, and there was significant difference before and after intervention ($P < 0.05$). (Table 2)

After the sports injury prevention method in this paper, the total score of FMS functional screening is shown in Figure 2.

Figure 2 shows that after applying the sports injury recommendations proposed in this paper, the FMS measurements of the elderly are much better than before. The number of people with 12-14 points also tends to drop to 1, with more people with 15-19 points, of which 16 and 17 points are the most.

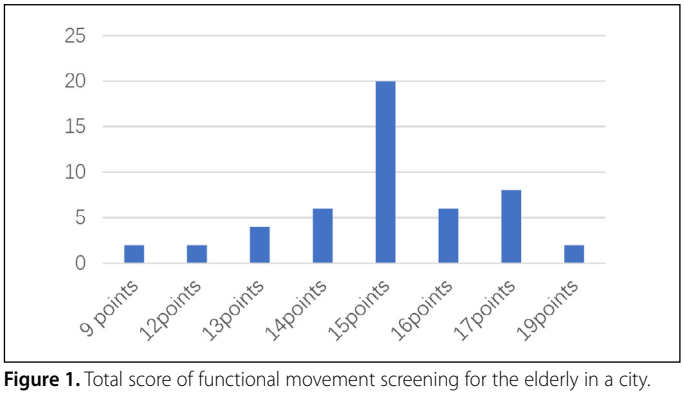

Figure 1. Total score of functional movement screening for the elderly in a city.

Table 1. Basic information of subjects.

Gender	Number	Height (cm)	Age (year)
Male	38	170±4.2	69±2.3
Female	12	160±2.1	68.5±1.2

Table 2. Comparison of FMS scores before and after intervention training.

Option	Score	P
Before	12.4 (9.75~13.00)	0.047
After	19.1 (17.50~19.75)	

Comparative analysis of FMS test of the elderly before and after technical movement analysis

In this study, paired sample t-test was used to analyze the results of functional exercise screening before and after. See Table 3 for the comparison of experimental tests. In this study, 50 elderly people underwent six weeks of corrective training to compare the functional exercise screening before and after technical analysis.

The comparative analysis of functional movement screening (FMS) for the elderly after technical analysis is shown in Table 4.

The t-test of correlation samples shows that the P values before and after the experiment are less than 0.05, and there is a significant difference; It shows that the corrective effect of exercise can help the elderly reduce the risk of injury. As for the changes of various indexes before and after the experiment, after correction training, there was no significant difference in trunk rotation stability except after the experiment. In the other six tests, the evaluation of technical movement analysis after correction is significantly higher than that before correction. At the same time, it also shows that the corrective exercise training in physical training is helpful to improve the screening test of functional exercise performance of the elderly.

DISCUSSION

The most fundamental cause of sports injury in the elderly is the deterioration of physical function at the physiological level. Existing studies generally believe that the prevention of sports injury for the elderly should start with sports, and choose sports that are easy to adapt to the physical function of the elderly. General education on sports injury prevention suggests that the elderly choose mild sports activities suitable for their physical function to effectively reduce the occurrence of sports injury, but this view reduces the elderly's awareness of safety protection to a certain extent, thus increasing the possibility of sports injury.[5] Therefore, this paper believes that the primary measure to prevent sports injury of the elderly is to improve the physique of the elderly. Age-appropriate strength, activity ability and cardiopulmonary function training can improve the performance of the elderly and reduce the frequency of sports injury. In terms of improving the physical function of the elderly, we are trying to introduce the physical training method of competitive sports. However, in view of the natural degradation of the elderly, we should appropriately reduce the training intensity, simplify the training content, and adapt the training amount to the physical condition of the elderly.[6] Combined with the characteristics of the elderly, choose a family physical exercise method for the elderly with simple training methods, convenient purchase of props and flexible exercise places. According to the sports characteristics of the elderly, we should pay more attention to three aspects of resistance training to increase the strength of the elderly. Aerobic exercise improves cardiopulmonary function and flexibility exercise improves Rom. different elderly people can choose their own training methods according to their own health status, and adjust the training intensity and amount according to their own needs.[7]

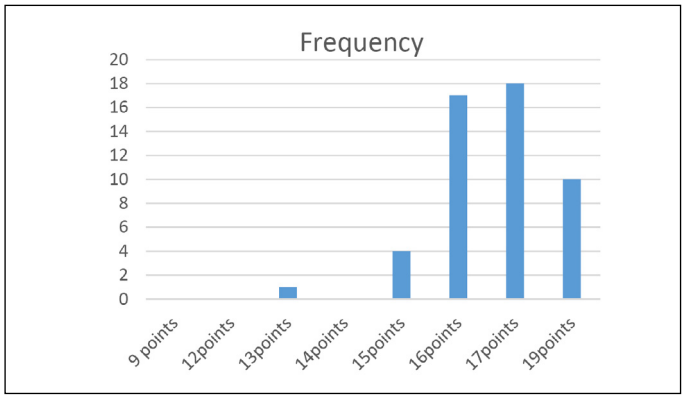

Figure 2. Score of each action in functional action screening.

Table 3. Comparative Analysis of functional movement screening (FMS) for the elderly before technical analysis (x ± SD).

Test indicator	Score	T	P
Overhead	1.41±0.98	-1.533	0.170
Hurricane	1.98±1.00	-0.787	0. 452
Straight bow arrow	1.98±1.00	-0.99	0.352
Shoulder flexibility	2.11±1.22	0.000	0.99
Practice straight knee leg	2.54±0.54	0.99	0.352
Torso stability push-ups	2.40±1.13	-0.882	0. 402
Torso Rotation Stability	1.69±0.76	0.99	0.352

Table 4. Comparative analysis of functional movement screening (FMS) for the elderly after technical analysis (x ± SD).

Test indicator	Score	T	P
Overhead	2.54±0.79	2.799	0.029
Hurricane	2.40±0.54	-0. 542	0. 597
Straight bow arrow	2.54±0.54	2.099	0.077
Shoulder flexibility	2.40±1.13	0.99	0.352
Practice straight knee leg	2.97±0.00	0.99	0.352
Torso stability push-ups	2. 83±0.38	0.882	0. 402
Torso Rotation Stability	1.98±0.00	-	-

The irregular movement of the elderly can easily lead to sports injury. The respondents said that when the elderly exercise, there are few sports instructors to participate, mainly through self-study or mutual imitation. Sports posture often causes sports injury due to incorrect sports posture. Strengthening the exercise of the exercise mode of the elderly can effectively improve the poor posture of the elderly and avoid sports injury. Movement pattern is the basis of mastering movement skills. The human brain does not directly participate in the control of movement sequence, but forms a complete movement program through various movement patterns. The correct motion model is the key factor to create a good range of motion. The motion sequence consists of several simple body motion patterns. Due to the physical decline of the elderly, the basic action mode is deformed, and the self-executive action mode deviates from the standard action mode, which is manifested in the incorrect action sequence, resulting in sports injury. Exercise mode training for the elderly means that the elderly can exercise safely for as long as possible. By allowing the elderly to train the correct exercise sequence, correct deformation and incorrect basic exercise mode, they can constantly update the exercise matrix and remove the exercise restrictions.

CONCLUSION

Under the dual background of population aging and sports popularization, the number of the elderly engaged in sports activities is increasing year by year, and the number of the elderly engaged in sports is also increasing. Based on the comprehensive screening of previous sports injury literature and the analysis of the effect of sports training technology for the elderly, combined with practical interviews, this paper comprehensively analyzes the current situation and prevention of sports injury for the elderly, puts forward the FMS measurement method, compares the methods proposed in this paper to prevent sports injury for the elderly, and finally determines its effectiveness; This paper also takes the FMS test items for testing the physical training of the elderly as an example, and analyzes the technical movements, hoping to provide some physical training for the elderly.

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