

# PREVENTION OF KNEE INJURIES USING TEAM SPORTS IN THE AGED POPULATION



ORIGINAL ARTICLE  
ARTIGO ORIGINAL  
ARTÍCULO ORIGINAL

PREVENÇÃO DE LESÕES NO JOELHO POR ESPORTES DE EQUIPE EM IDOSOS

PREVENCIÓN DE LESIONES DE LA RODILLA POR DEPORTES DE EQUIPO EN PERSONAS MAYORES

Feng Pan<sup>1</sup>   
(Physical Education Professional)

1. Qiqihar Medical University,  
Department of Physical  
Education and Research, Qiqihar,  
Heilongjiang, China.

## Correspondence:

Feng Pan  
Heilongjiang, China, 161006.  
panfeng790607@163.com

## ABSTRACT

**Introduction:** The aging population in the growing national industrialization and urbanization supports an unhealthy lifestyle where the prevention and control of chronic diseases are difficult. Approximately 68% of the elderly have some type of chronic disease, mostly musculoskeletal, especially in the knee joint, compromising their autonomy and affecting their social life, with psychological impacts in the long term. Team sports suggest great therapeutic potential in this group, but there are few studies. **Objective:** Analyze the situation of team sports among the elderly, propose methods to prevent knee joint injuries, and test these implements' preventive effects. **Methods:** 92 elderly volunteers who participated in community sports were selected. To understand the causes and main types of knee joint injuries, the elderly were analyzed during community sports, including using the FMS method for health testing. **Results:** After the tests, it can be seen that the mean FMS score of all the community elderly is 14.23 points, and the total score is 12.00-17.00; the mean score of the overall knee joint injury is increased by 2.65, and the mean FMS score of the female knee joint injury is greatly benefited. **Conclusion:** After the proposed preventive measures focused on the knee joint, the AFF examinations of the community elderly were significantly improved, indicating that the proposed actions are effective and deserve to be replicated. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Aged; Team Sports; Knee Injuries.

## RESUMO

**Introdução:** O envelhecimento populacional na crescente industrialização e urbanização nacional lastreia um estilo de vida insalubre onde a prevenção e o controle de doenças crônicas são difíceis. Aproximadamente 68% dos idosos possuem algum tipo de doença crônica, majoritariamente de cunho musculoesquelético com destaque para a articulação do joelho, comprometendo a autonomia e prejudicando seu convívio social, com impactos psicológicos à longo prazo. Os esportes de equipe sugerem grande potencial terapêutico nesse grupo, porém há poucos estudos nesse sentido. **Objetivo:** Analisar a situação do esporte de equipe entre os idosos, propondo métodos para prevenir lesões articulares no joelho e testar o efeito preventivo dessas implementações. **Métodos:** Foram selecionados 92 voluntários idosos que participaram de esportes comunitários. Para entender as causas e os principais tipos de lesões articulares do joelho, os idosos foram analisados durante os esportes comunitários, incluindo a utilização do método FMS para a realização de testes de saúde. **Resultados:** Após os testes, pode-se ver que a pontuação média da FMS de todos os idosos da comunidade é de 14,23 pontos, e a pontuação total é de 12,00-17,00; a pontuação média da lesão geral da articulação do joelho é aumentada em 2,65, e o escore médio de FMS da lesão articular feminina do joelho é muito beneficiado. **Conclusão:** Após a proposta de medidas preventivas focadas na articulação do joelho, os resultados dos exames de AFF dos idosos da comunidade foram significativamente aprimorados, indicando que as ações propostas são eficazes e merecem ser replicadas. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Idoso; Esportes de Equipe; Lesões do Joelho.

## RESUMEN

**Introducción:** El envejecimiento de la población en la creciente industrialización y urbanización nacional favorece un estilo de vida poco saludable donde la prevención y el control de las enfermedades crónicas son difíciles. Aproximadamente el 68% de los ancianos tienen algún tipo de enfermedad crónica, en su mayoría de naturaleza musculoesquelética con énfasis en la articulación de la rodilla, comprometiendo la autonomía y perjudicando su vida social, con impactos psicológicos a largo plazo. Los deportes de equipo sugieren un gran potencial terapéutico en este grupo, pero hay pocos estudios en este sentido. **Objetivo:** Analizar la situación de los deportes de equipo entre las personas mayores, proponiendo métodos para prevenir las lesiones de la articulación de la rodilla y comprobar el efecto preventivo de estas implementaciones. **Métodos:** Se seleccionaron 92 voluntarios de edad avanzada que participaban en deportes comunitarios. Para comprender las causas y los principales tipos de lesiones de la articulación de la rodilla, se analizó a los ancianos durante la práctica de deportes comunitarios, incluso utilizando el método FMS para las pruebas de salud. **Resultados:** Después de las pruebas, se puede observar que la puntuación media de FMS de todos los ancianos de la comunidad es de 14,23 puntos, y la puntuación total es de 12,00-17,00; la puntuación media de la lesión general de la articulación de la rodilla se incrementa en 2,65, y la puntuación media de FMS de la lesión



de la articulación de la rodilla femenina se ve muy beneficiada. Conclusión: Tras las medidas preventivas propuestas centradas en la articulación de la rodilla, los resultados de los exámenes de AFF de los ancianos de la comunidad mejoraron significativamente, lo que indica que las acciones propuestas son eficaces y merecen ser replicadas.

**Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Anciano; Deportes de Equipo; Lesiones de la Rodilla.

DOI: [http://dx.doi.org/10.1590/1517-8692202329012022\\_0170](http://dx.doi.org/10.1590/1517-8692202329012022_0170)

Article received on 03/15/2022 accepted on 05/31/2022

## INTRODUCTION

In recent years, with the acceleration of China's industrialization, urbanization and population aging, as well as the influence of unhealthy lifestyle, environmental degradation, food security and other factors, the prevention and control of chronic diseases has been very difficult. In 2016, according to the data released by the national health and Family Planning Commission, 150 million of the country's 220 million elderly over the age of 60 suffered from chronic diseases, accounting for 68.2% of chronic diseases. At the same time, the elderly have a huge demand for chronic disease health services and family support, and the economic burden is becoming increasingly heavy. It has become a serious public health problem restricting the country's economic and social development. In order to curb the high incidence of chronic diseases, the national health and Family Planning Commission and relevant departments have taken positive and effective measures. The general office of the State Council issued the medium and long term plan for the prevention and control of chronic diseases in China (2017-2025) to implement the prevention and control of chronic diseases in the next 5-10 years; In order to reduce the burden of chronic diseases, strive for full-cycle and comprehensive health protection and improve residents' health and life expectancy.<sup>1</sup>

As a special social group, most of the chronic diseases of the elderly are caused by chronic degenerative diseases of organs, such as osteoarthritis, spinal degenerative diseases, osteoporosis and other common diseases of the skeletal system, which often lead to the damage or loss of motor skills. The increasing demand for medical services will not only increase the medical expenses of families, but also bring a certain burden to the society. With the low level of social and economic development and the aggravation of aging, solving degenerative diseases such as motor skills of the elderly is of great significance to promote the health of the elderly and realize healthy aging.<sup>2</sup>

Firstly, a large number of studies at home and abroad show that moderate exercise is an important means to prevent and treat diseases, prolong life and improve the quality of life. Secondly, exercise can promote the mental health of the elderly, give spiritual sustenance, slow down and alleviate the psychological loneliness, anxiety and depression of the elderly, and obtain physical and mental pleasure from exercise. Exercise increases the opportunities for the elderly to communicate and integrate into society, so that the elderly can adapt to the changing social roles faster and increase their self-esteem, so as to meet their own needs for achievement. The outline of healthy China 2030 plan clearly proposes to strengthen the combination of sports with medical and non-medical health intervention, promote sports activities for key groups, and give full play to the positive role of national fitness Science in health promotion. Give full expression to the prevention and rehabilitation of chronic diseases. Therefore, the research on physical activity of the elderly in the community is of great significance to enrich the theory of physical activity of the elderly and improve the government's public health ability under the background of aging.<sup>3</sup>

Based on the analysis of the causes of knee injury and the FMS method of knee injury, this study uses the research methods of questionnaire survey and expert interview to study the common sports injuries in

community sports, in order to make the elderly community take time to optimize the exercise methods of the elderly, prevent and reduce the frequency of knee injury and improve the sports level, increase the exercise duration of the elderly.<sup>4</sup>

## METHOD

### Research object

This study focuses on the investigation and prevention of sports knee injury of the elderly in the community. 92 elderly people participating in community sports were selected as the survey objects to understand the causes and types of knee injury in community sports, as well as the effects of training and different exercise levels on knee injury in recent years. Then they tested the knee joint of the elderly in combination with FMS method. Then, according to the suggestions of knee sports injury prevention proposed in this paper, the training was carried out for 12 weeks, and finally the FMS test was carried out again. The study and all the participants were reviewed and approved by Ethics Committee of Qiqihar Medical University (NO. 202126182).

The basic information of the respondents in this survey is as follows: according to the effective response rate of the questionnaire, the total number of respondents is 92, including 78 males, accounting for 84.8% and 14 females, accounting for 15.2%.

### Scoring criteria

FMS test consists of seven single action modal tests, which can score the performance of the test action according to the subject, and the score range is 0-3 points. If the test object successfully completes the specific test action and has no obstacles, the screening will get 3 points; if the subject has some abilities to perform specific test actions but has some compensatory functional actions, determine the screening action and give 2 points; if the subject is unable to perform specific test actions due to physical dysfunction, the screening action shall be recorded as 1 point; if the subject feels pain while performing a specific test action, the screening score is 0. The single element test of all seven movement modes requires five movement tests to test obstacle frame, straight bow squat, shoulder flexibility, active right knee elevation and rotational stability on the left and right respectively. The final score of this test shall be subject to the low score on both sides.

## RESULTS

### Knee injury of the elderly in the community

According to Table 1, among the 92 elderly surveyed, 60.9% had a history of knee injury in community sports, and 39.1% had no knee injury.

The survey results show that due to the differences in congenital physical conditions and special training years between men and women, the elderly have different exercise and exercise habits during exercise, so the degree of knee injury is different, as shown in Table 2.

As shown in Table 2, among the 92 elderly sports in a community, 79 were male, 49 were injured in knee joint, and the injury rate was as high as 62%; There were 13 women and 7 knee injuries, with an injury rate of 53.8%.

**Table 1.** Investigation on knee injury of the elderly in a community (n = 92).

Injury	Knee injury	No injury to knee joint	Total
Number of people	56	36	92
Percentage	60.9%	39.1%	100%

**Table 2.** Investigation on knee joint injury of elderly people of different genders (n = 92).

Gender	Total number	Number of injured	Percentage
Male	79	49	62%
Female	13	7	53.8%

## Injury of the elderly in the community with a history of knee injury

In order to truly and comprehensively understand the knee injury of the elderly in community sports, 56 elderly with knee injury were sampled and statistically analyzed. The results showed that the proportion of left knee injury in the elderly reached 42%. The second is the bilateral knee joint injury rate of 34%, and the right knee joint injury of 24% of the elderly, as shown in Table 3.

According to the data in Table 3, the total number of injuries is 56, with an average of 1.9 per person.

Knee injury seriously affects the elderly to participate in normal sports and life. The majority of scholars and researchers are actively looking for ways to reduce the occurrence of injury. Therefore, we conducted an in-depth investigation on the years of exercise and knee injury, as shown in Table 4.

The results showed that 56 elderly people had knee injury in sports training. The longest training time was 13 years and the shortest was only 1 year. Table 10 shows that among the 56 elderly with knee injuries, 28 were injured, and the exercise time was 4-6 years, accounting for 50% of the total number of injuries; 12 people who have been engaged in sports activities for 7-9 years, accounting for 21.4% of the total number of injuries, and 8 elderly people aged 10-13, accounting for 13.9% of the total number of accidents; The remaining 14.7% of the injured elderly have a training period of 1-3 years.

## Comparison of FMS scores of the elderly with a history of knee injury in the community

After the test, it can be seen that the average FMS score of all the elderly in a community is 14.09, and the total score is 12.00-17.00 (see Table 5). According to the literature, functional exercise screening score  $\leq 14$  is considered as unqualified score, which can reasonably identify the individuals most likely to be injured. Individuals with a score lower than 14 have a higher potential risk of injury and disease, and the risk of injury is obvious.

According to the preventive measures suggested in this paper, the test results of 56 elderly people in the community after 12 weeks are shown in Table 6. The FMS scores of 56 elderly people have improved, all exceeding the FMS pass line. The overall average score has increased by 2.65, the average FMS score of men has increased by 2.52, and the average FMS score of women has increased by 2.66. The average FMS score of women was higher than that of men.

## DISCUSSION

The knee joint injury of the elderly in community sports is mainly caused by the local overload or unbalanced force of the knee joint because the load intensity of the knee joint exceeds its own carrying capacity. A variety of sports practice shows that excessive exercise load during exercise can easily lead to excessive pressure on knee joint, fatigue and sports injury. From the perspective of stress physiology, repeated overload stimulation of the knee joint for a long time will damage its

**Table 3.** Investigation on the number of knee injuries in the elderly with a history of knee injury in a community (n = 56).

Number of injuries	1	2	> 3	Total
Number of people	30	12	14	56
percentage	54%	22%	24%	100%

**Table 4.** Relationship between the incidence of knee injury and exercise years in the elderly with a history of knee injury (n = 56).

Training years	1-3	4-6	7-9	10-13	Total
Number of people	8	28	12	8	56
Percentage	14.7%	50%	21.4%	13.9%	100%

**Table 5.** Total FMS scores of the elderly with a history of knee injury in a community.

	Mean $\pm$ SD	Range
Overall (N=56)	14.23 $\pm$ 1.39	12.00—17.00
Male (N=49)	14.14 $\pm$ 0.90	12.00—17.00
Female (N=7)	14.34 $\pm$ 1.94	12.00—17.00

**Table 6.** FMS scores of elderly people with a history of knee injury in a community after prevention according to this article.

	Mean $\pm$ SD	T	P
Overall (N=56)	16.88 $\pm$ 1.11	-3.47	0.003
Male (N=49)	16.66 $\pm$ 0.85	-5.05	0.0005
Female (N=7)	17.00 $\pm$ 1.42	-2.65	0.03

internal physiological microstructure and reduce the excitability of neurons. In this state, if the load is not adjusted with time, the overall macro material and energy metabolism of the knee joint will change abnormally, resulting in the damage of the normal function of the knee joint, resulting in functional degradation and corresponding functional degeneration, such as effusion in the joint cavity, insufficient secretion of joint synovial fluid, calcification of ligament attachment points, etc., resulting in sports knee joint injury.<sup>5</sup>

The elderly often use knee joints in sports. Their physical quality is not high enough and the joint density is very low. The degree of recovery of the elderly after exercise is related to their aerobic capacity. Strong aerobic capacity can not only delay fatigue during exercise, but also make rapid recovery after exercise. The muscles related to aerobic capacity are usually deep small muscle groups. Most of these muscles are slow muscles, which play an important role in maintaining joint stability. The development of small muscle groups depends on slow movement speed for exercise, and the load is relatively small. Common knee joint maintenance exercises include front and rear step squats and left and right step squats.<sup>6</sup>

The internal and external strength training of the knee joint of the elderly is often ignored in sports, especially for the elderly with less exercise, low muscle strength and loose joints, we should pay more attention to the coordination of the strength of each muscle group. Lateral activation and braking are the most common ways of movement, so the stability of medial and lateral knee joints is particularly important. One end of the elastic band is attached to the ankle, the other end is attached to the distal end of the same side of the limb, and the lower limbs are retracted from outside to inside. The elderly can also lie on their back, bend their legs, and support their hips with their heels to keep their bodies at the same level. The advantage of this exercise is that when training the strength of the core area of the human body, join the strength training of the inner side of the knee. Similarly, the training of lateral strength can be carried out in the opposite direction of the elastic belt, or the knee joint can resist the force from the elastic belt under the posture of supine flexion and supporting the hip.

## CONCLUSION

Knee injuries are common among the elderly in a community, accounting for 60.9% of the total. The types of injuries are mainly meniscus and medial collateral ligament injuries, followed by knee bursitis, and finally anterior cruciate ligament injuries. The degree of injury is usually mild to moderate. The rate of knee injury in men is slightly higher than that in women, and the injury season is mainly winter and summer, especially in special sports. On the basis of this situation, this paper puts forward some suggestions on the prevention of knee injury in community sports for the elderly, and then uses FMS to test the FMS score of the elderly in a community at the beginning and the FMS score of 12 weeks after accepting the knee prevention suggestions put forward in this paper. Finally, the FMS score 12 weeks after accepting the suggestions of knee

joint prevention measures in this paper is higher than the initial FMS score, which shows that the knee joint prevention measures proposed in this paper are effective and hope to be helpful to prevent knee joint injury in sports for the elderly.

## ACKNOWLEDGEMENTS

2021 Social Science Fund Project of Qiqihar Medical College Project Title: Research on the Construction of the Community Sports Public Service System for the Elderly in Qiqihar City from the Perspective of Embedded Pensions, Project Number: QYSKL2021-09YB.

---

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

---

---

**AUTHORS' CONTRIBUTIONS:** Every author has made an important contribution to this manuscript. FP: writing and execution.

---

## REFERENCES

1. Tavares D, Pelizaro PB, Pegorari MS, Paiva MM, Marchiori GF. Prevalence of self-reported morbidities and associated factors among community-dwelling elderly in Uberaba, Minas Gerais, Brazil. *Cien Saude Colet*. 2019;24(9):3305-13.
2. Khan S, Singer B, Vaughan D. Molecular and physiological manifestations and measurement of aging in humans. *Aging cell*. 2017;16(4):624-33.
3. Freire Junior RC, Fernandes TG, Borges GF, Guerra RO, Abreu DCC. Factors associated with low levels of physical activity among elderly residents in a small urban area in the interior of the Brazilian Amazon. *Arch Gerontol Geriatr*. 2018;75:37-43.
4. Lins L, Carvalho FM. SF-36 total score as a single measure of health-related quality of life: Scoping review. *SAGE Open Medicine*. 2016;4:2050312116671725.
5. Alexandre TS, Cordeiro RC, Ramos LR. Fatores associados à qualidade de vida em idosos com osteoartrite de joelho. *Fisioter Pesqui*. 2008;15(4):326-32.
6. Hana S, Aicha BT, Selim D, Ines M, Rawdha T. Clinical and radiographic features of knee osteoarthritis of elderly patients. *Curr Rheumatol Rev*. 2018;14(2):181-7.