

# PHYSICAL TRAINING GUIDED BY FUNCTIONAL MOVEMENT SCREEN IN THE REHABILITATION OF SPORTS INJURIES



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TREINO FÍSICO GUIADO POR SISTEMA DE MOVIMENTO FUNCIONAL NA REABILITAÇÃO DE LESÕES ESPORTIVAS

ENTRENAMIENTO FÍSICO GUIADO POR EL SISTEMA DE MOVIMIENTO FUNCIONAL EN LA REHABILITACIÓN DE LESIONES DEPORTIVAS

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## ABSTRACT

**Introduction:** The Functional Movement Screen is a standardized tool that proposes the evaluation of movement and body stability. That information can assist in decision-making for accurate and focused training programs. However, few studies address its use in the rehabilitation of table tennis players. **Objective:** Perform an experimental study on the physical training guided effect by the Functional Movement System method in sports injuries rehabilitation. **Methods:** Ten table tennis players, aged 18 to 24 years, with knee assessment scale scores between 6 and 8 points and skill level II in the sport were selected. The individuals underwent three months of physical training guided adequately by the screening results. SPSS20 software was used to analyze body composition indices, including thigh and calf circumferences. Lower limb torque was also compared. **Results:** There was no change in weight or BMI; however, a difference was noted in the thigh (from 52.61 cm to 53.26 cm) and calf (from 32.34 cm to 33.16 cm) circumference. Statistical difference was noted in squat, straight knee raise, hurdles, and flexion tests ( $P < 0.001$ ). **Conclusion:** The Functional Movement System proved to be effective as a screening and assessment tool for rehabilitation in knee injuries of table tennis players.

**Evidence Level II; Therapeutic Studies - Investigating the result.**

**Keywords:** Triage; Sports Injuries; Human Physical Conditioning.

## RESUMO

**Introdução:** O Sistema de Movimento Funcional é uma ferramenta para triagem de movimento padronizada que propõe avaliar a qualidade dos movimentos e estabilidade corporal do indivíduo. Essas informações podem auxiliar na tomada de decisões para programas de treinamento precisos e focados. Porém, há poucos estudos abordando sua utilização na reabilitação em jogadores de tênis de mesa. **Objetivo:** Fazer um estudo experimental sobre o efeito do treinamento físico guiado pelo método de Sistema de Movimento Funcional na reabilitação de lesões esportivas em jogadores de tênis de mesa. **Métodos:** Foram selecionados 10 jogadores de tênis de mesa com idade entre 18 a 24 anos com pontuação de escala na avaliação do joelho entre 6 a 8 pontos e grau de habilidade II no esporte. Os indivíduos passaram por três meses de treinamento físico devidamente orientado pelos resultados da triagem. Foi utilizado o software SPSS20 para análise estatística com índices de composição corporal, incluindo circunferências de coxa e panturrilha. O torque dos membros inferiores também foi comparado. **Resultados:** Não houve alteração de peso ou IMC, porém foi notada diferença na circunferência de coxa (de 52,61 cm para 53,26 cm) e panturrilha (de 32,34 cm para 33,16 cm). Foi notada diferença estatística nos testes de agachamento, elevação reta do joelho, obstáculos e flexão ( $P < 0,001$ ). **Conclusão:** O Sistema de Movimento Funcional mostrou-se eficaz como ferramenta de triagem e avaliação para a reabilitação em lesões de joelho dos jogadores de tênis de mesa. **Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.**

**Descritores:** Triagem; Lesões Esportivas; Condicionamento Físico Humano.

## RESUMEN

**Introducción:** El Sistema de Movimiento Funcional es una herramienta estandarizada de exploración del movimiento que propone evaluar la calidad del movimiento y la estabilidad corporal del individuo. Esta información puede ayudar en la toma de decisiones para programas de formación precisos y enfocados. Sin embargo, hay pocos estudios que aborden su uso en la rehabilitación de jugadores de tenis de mesa. **Objetivo:** Realizar un estudio experimental sobre el efecto del entrenamiento físico guiado por el método del Sistema de Movimiento Funcional en la rehabilitación de lesiones deportivas en jugadores de tenis de mesa. **Métodos:** Se seleccionaron diez jugadores de tenis de mesa de entre 18 y 24 años con puntuaciones en la escala de evaluación de la rodilla de entre 6 y 8 puntos y con un grado de habilidad II en el deporte. Los individuos se sometieron a tres meses de entrenamiento físico debidamente guiados por los resultados del cribado. Se utilizó el programa informático SPSS20 para el análisis estadístico con los índices de composición corporal, incluidas las circunferencias de los muslos y las pantorrillas. También se comparó la torsión de los miembros inferiores. **Resultados:** No hubo cambios en el peso ni en el IMC, sin embargo, se observaron diferencias en la circunferencia del muslo (de 52,61 cm a 53,26 cm) y de la pantorrilla (de 32,34 cm a 33,16 cm). Se



observaron diferencias estadísticas en las pruebas de sentadilla, elevación de rodilla recta, vallas y flexión ( $P < 0,001$ ).  
**Conclusión:** El Sistema de Movimiento Funcional demostró ser eficaz como herramienta de cribado y evaluación para la rehabilitación en lesiones de rodilla de jugadores de tenis de mesa. **Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.**

**Descriptor:** Cribado; Traumatismos en Deportes; Acondicionamiento Físico.

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## INTRODUCTION

As a new training system, physical training is mainly combined with rehabilitation training, and then according to the sports function level of people's sports, help them develop sports quality in a coordinated way. It also plays an important role in improving people's sports physical fitness. At present, it has been applied to sports training and achieved good results. The so-called physical training is a new training method composed of multi-disciplinary professional knowledge.<sup>1</sup> Physical training is as important as technical, psychological and tactical training for people's sports. It is a necessary training for people's sports to improve their sports level and challenge their sports limits. Physical fitness includes general physical fitness and professional physical fitness. Physical fitness level determines the basic level and potential of people's sports competitive ability.<sup>2</sup>

People's physical fitness is relatively poor. Once an injury event occurs in the process of physical training, it is difficult to treat and recover through traditional medical means. Therefore, it is necessary to integrate the concept of human energy training in the process of physical training. With the help of brand-new sports medicine means, sports nutrition supply and functional rehabilitation means, people's sports injury events can be reduced. In case of injury, people's sports recovery can be promoted as soon as possible and the impact of sports injury on people's sports can be reduced.<sup>3</sup> Through personalized physical training, combined with machine energy monitoring and scientific nutritional means, sports injuries can be effectively prevented, people's sports can restore body function and improve special sports ability. Generally speaking, physical training includes three kinds of training: the first is people's exercise ability training under the condition of physical health; The second is the decline of people's function after sports injury, and help people find the location and cause of injury through training; The third is to help people exercise and reduce pain through rehabilitation training, so as to restore motor function. Taking table tennis as an example, this paper makes an experimental study on the effect of physical training on the rehabilitation of sports injury.<sup>4,5</sup>

## METHOD

### Research object

Experimental study on the prevention and treatment of knee injury of table tennis players by physical training. Twenty table tennis lovers were selected as the experimental objects. They were tested for FMS (function movement screen), body composition, vertical jump, circumference and strength, so as to understand the knee function and injury of athletes, formulate reasonable rehabilitation physical training methods for the prevention and treatment of knee injury, and carry out training.

### Experimental method

Screening criteria for subjects:

Inclusion criteria: 1. Age between 18-24 years old; 2. Table tennis grade II (or above); 3. For athletes who meet the scores of FMS and knee evaluation scale, the score of FMS test is less than 8 points (out of 12 points), and the score of knee evaluation scale is less than 90 points (out of 100 points).

Exclusion criteria: 1. Do not meet the inclusion age; 2. Not conforming to the sports grade; 3. Unable to complete training due to injury; 4. 0 point in FMS test; 5. Those who do not sign the informed consent form.

### Mathematical statistics

Spss20.0 mathematical statistics software and Microsoft Office Word 2003 are used to make statistical analysis and charts of the obtained data.

### Logical analysis method

Through logical methods such as induction, deduction, analogy and comprehensive analysis, this paper makes a more in-depth analysis of the obtained data, deduces the corresponding conclusions, and puts forward reasonable and scientific suggestions on this basis.

## RESULTS

### Body shape indexes of people before and after physical training

See Table 1 for the body shape indicators of the people.

It can be seen from Table 1 that after three months of physical training, the physical indexes of the people before and after physical training are compared. The independent sample t-test shows that there is no significant difference in body weight and BMI between the people before and after physical training ( $P > 0.05$ ), but there is significant difference in thigh circumference and calf circumference before and after training ( $P < 0.05$ ). Before physical training, the average thigh circumference was 52.61cm and the average calf circumference was 32.34cm. However, after training, the average thigh circumference was 53.26cm and the average calf circumference was 33.16cm.

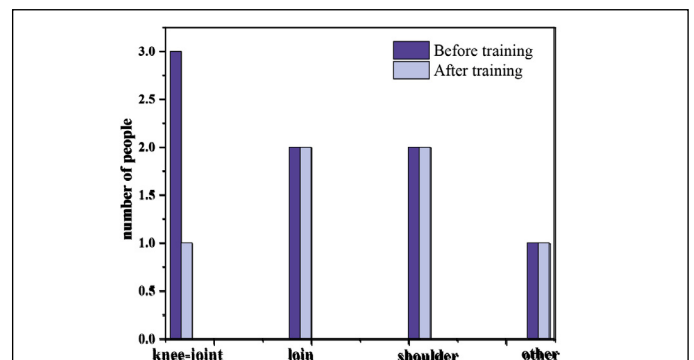
### Sports injuries of people before and after physical training

It can be seen from Figure 1 that before physical training, three people had knee injury, two had waist injury, two had shoulder injury and one

**Table 1.** Body shape index of people (n = 10).

	Before training	After training
Weight (kg)	54.51±2.33	54.54±1.74
BMI (kg/m <sup>2</sup> )	21.23±1.28	21.21±1.22
Thigh circumference (cm)	52.61±0.61	53.26±0.61*
Calf circumference (cm)	32.34±0.13	33.16±0.53*

Note: \* is  $p < 0.05$ .



**Figure 1.** Comparison of injury parts of athletes before and after training.

had other injuries. The injuries of these people belong to chronic injuries and can normally participate in training, but they often have slight pain when the load of special training intensity is large. After physical training, one athlete had knee injury, two athletes had waist injury, two athletes had shoulder injury and one athlete had other injuries.

### Evaluation of athletes' physical quality before and after physical training

It can be seen from Table 2 that after 3 months of physical fitness training, the scores of FMS test before and after physical fitness training of the people have significant differences in squats, hurdles, lunge squats and straight knee lifts compared with those before and after physical fitness training ( $P < 0.01$ ). Among them, the average score of squat before physical training is 1.6, hurdle is 1.7, lunge squat is 1.8, and straight knee lift is 2.0; After training, the average score of squat is 2.2, hurdle is 2.3, lunge squat is 2.3, and straight knee lift is 2.5. Before training, the stability of knee joint was poor, and the body shook obviously in the hurdle test. The average score of hurdle was 1.7, but after training, the average score of hurdle was increased to 2.3.

### Peak torque of knee flexor and extensor before and after physical training

It can be seen from Table 3 that after 3 months of physical training, the flexor and extensor torque test before and after training shows that the flexor and extensor torque before and after training is significant ( $P < 0.05$ ). Before training, the average value of left flexion was  $78.3n \cdot m$ , the average value of left extension was  $154.6n \cdot m$ , the average value of right flexion was  $84.8n \cdot m$ , the average value of right extension was  $157.1n \cdot m$ , and after training, the average value of left flexion was  $98.1n \cdot m$ , the average value of left extension was  $176.5n \cdot m$ , the average value of right flexion was  $125.0n \cdot m$ , and the average value of right extension was  $170.2n \cdot M$ .

**Table 2.** Scores of FMS tests (unit: score,  $n = 10$ ).

	Before training	After training
Squat	1.6±0.37	2.2±0.71**
Hurdle	1.7±0.31	2.3±0.58**
Lunge squat	1.8±0.21	2.3±0.41**
Straight knee lift	2.0±0.21	2.5±0.41**

Note: \* is  $p < 0.05$ , \*\* is  $p < 0.01$ .

**Table 3.** Peak torque of flexor and extensor group at 600 / S ( $n = 10$ ).

	Before training	After training
Left flexion	78.3±4.05	98.11±4.71*
Left extension	154.6±5.35	176.5±2.45
Right flexion	84.8±1.48	125.0±3.48*
Right extension	157.1±8.11	170.2±4.02*

Note: \* is  $p < 0.05$ .

## DISCUSSION

### Effect of physical training on body shape

After 3 months of physical training, there was significant difference in the circumference of big and small legs before and after training ( $P < 0.05$ ). Due to the influence of knee joint stability training and strength training on the muscle groups around the knee joint in physical training,

stability training strengthens the soleus muscle and fat intestinal muscle of the lower leg, and strength training strengthens the quadriceps femoris and biceps femoris of the thigh.<sup>6,7</sup> The average thigh circumference increased from 52.61cm to 53.26cm before training, and the average calf circumference increased from 32.34cm to 33.16cm before training. Therefore, physical training has an impact on body shape and increases the circumference of athletes' knee, thigh and calf.

### Effect of physical training on sports injury of people

After 3 months of rehabilitation physical training, there was significant difference in injury before and after physical training. Before training, people's sports injuries were knee, waist, shoulder and other parts, of which knee joint injury accounted for the largest proportion. Because the knee joint of table tennis players needs to be in the flexion state to complete various steps and swing movements, maintaining this movement for a long time is easy to lead to knee joint injury. Therefore, knee joint injury accounts for a large proportion in the injury of table tennis players. Among them, 3 athletes had knee injury, 2 athletes had waist injury, 2 athletes had shoulder injury and 1 athlete had wrist injury.<sup>8</sup> Therefore, physical training strengthens the flexor and extensor strength of the knee joint and enhances the stability of the knee joint. The number of knee joint injuries in table tennis gradually decreases. Only one athlete has knee joint injuries, but the number of injuries in other parts has not changed, indicating that rehabilitation physical training has an important impact on the prevention and treatment of athletes' knee joint injuries.<sup>9</sup>

### Effect of physical training on physical fitness FMS test

After 3 months of physical training, there was significant difference in the scores of hurdles, lunge squat and straight knee lift. Before physical training, the average score of active straight knee lift test was 2.0 due to their good flexibility. But after 3 months of physical training, the test scores of active straight knee lifting were increased from 2.5 to 1.8 points after training by means of foam shaft, peanut ball and other instruments. This shows that the relaxation of the fascia in physical training and the rolling massage of the tools such as foam shaft and peanut ball help to promote the athletes' muscle recovery and blood circulation. Traction relaxation helps to reduce muscle viscosity, promote muscle relaxation, reduce joint pressure and reduce the incidence of knee injury. Therefore, physical fitness has an important impact on FMS test and can improve the score of straight knee lifting in athletes' FMS test.<sup>10</sup>

## CONCLUSION

Sports health is not a simple sports proposition, nor a simple health proposition, but an integrated cross-border proposition. The concept of physical training pays attention to the life activity performance of a healthy person, not only athletes in the field of competitive sports, but also the fitness exercise of ordinary people in daily life, which can more comprehensively and effectively promote the improvement of various physical qualities in sports and provide important method guidance for people's sports health.

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