

# POSTURAL BALANCE ON BASKETBALL INJURIES

EQUILÍBRIO POSTURAL SOBRE AS LESÕES NO BASQUETEBOL

EQUILIBRIO POSTURAL EN LAS LESIONES DE BALONCESTO



ORIGINAL ARTICLE  
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## ABSTRACT

**Introduction:** Contemporary basketball has become more competitive and aggressive in the competition process, increasing the corresponding sport's risks. **Objective:** Analyze the injury risks arising from basketball and study the effects that postural balance training has on them. **Methods:** A controlled experiment was conducted, in which the experimental group used balance training and the control group used general physical training. Each training lasted one hour, twice a week, and the experimental period was nine weeks. **Results:** The total FMS scores of the two groups were improved before and after sports training, and the FMS scores of the control group were raised from 14.71 to 15.15, showing no significant difference ( $P>0.05$ ). The total FMS score in the experimental group increased from 14.38 to 17.69, much higher than the experimental group. It was found that there was a very significant difference. **Conclusion:** The method proposed in this paper can effectively increase the postural balance ability of athletes, thus reducing the risk of sports injuries in the development of sports. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

**Keywords:** Basketball; Sports Injuries; Postural Balance.

## RESUMO

**Introdução:** O basquetebol contemporâneo tornou-se mais competitivo e agressivo no processo de competição, aumentando também os riscos esportivos correspondentes. **Objetivo:** Analisar os riscos de lesão decorrentes do basquetebol e estudar os efeitos que o treinamento de equilíbrio postural tem sobre eles. **Métodos:** Foi realizado um experimento controlado, no qual o grupo experimental empregou treinamento de equilíbrio e o grupo de controle adotou treinamento físico geral. Cada treinamento durou uma hora, duas vezes por semana, e o período experimental foi de 9 semanas. **Resultados:** As pontuações totais de FMS dos dois grupos foram aperfeiçoadas antes e depois do treinamento esportivo, e as pontuações de FMS do grupo controle foram elevadas de 14.71 para 15.15, mostrando que não houve diferença significativa ( $P>0.05$ ). A pontuação total do FMS no grupo experimental aumentou de 14.38 para 17.69, muito superior à do grupo experimental. Constatou-se que houve uma diferença muito significativa. **Conclusão:** O método proposto neste trabalho pode aumentar efetivamente a capacidade de equilíbrio postural dos atletas, reduzindo assim o risco de lesões esportivas no desenvolvimento do esporte. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Basquetebol; Lesões Esportivas; Equilíbrio Postural.

## RESUMEN

**Introducción:** El baloncesto contemporáneo se ha vuelto más competitivo y agresivo en el proceso de competición, aumentando también los correspondientes riesgos deportivos. **Objetivo:** Analizar los riesgos de lesiones derivados del baloncesto y estudiar los efectos que el entrenamiento del equilibrio postural tiene sobre ellos. **Métodos:** Se llevó a cabo un experimento controlado, en el que el grupo experimental empleó el entrenamiento del equilibrio y el grupo de control adoptó el entrenamiento físico general. Cada entrenamiento duró una hora, dos veces por semana, y el periodo experimental fue de 9 semanas. **Resultados:** Las puntuaciones totales de FMS de los dos grupos mejoraron antes y después del entrenamiento deportivo, y las puntuaciones de FMS del grupo de control aumentaron de 14,71 a 15,15, lo que demuestra que no hubo diferencias significativas ( $P>0,05$ ). La puntuación total de FMS en el grupo experimental aumentó de 14,38 a 17,69, muy superior a la del grupo experimental. Se comprobó que había una diferencia muy significativa. **Conclusión:** El método propuesto en este trabajo puede aumentar eficazmente la capacidad de equilibrio postural de los atletas, reduciendo así el riesgo de lesiones deportivas en el desarrollo del deporte. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Baloncesto; Lesiones en Deportes; Equilíbrio Postural.



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## INTRODUCTION

Since the development of basketball, there has been a very mature training system, and the training objectives are very clear. The overall improvement of the physical quality of the participants is conducive to the overall development of basketball technology.<sup>1</sup> Moreover, based

on the theory of sports science, the training method has become more efficient. With the progress of the times, people's concept of sports has also changed.<sup>2</sup> Modern basketball is more competitive and confrontational in the course of competition, and the collision between the two sides on the court is more intense. Through the influence of various

aspects, the sports risk in modern basketball also increases.<sup>3</sup> Exploring how to effectively reduce the risk of sports injury can provide a certain security guarantee for the basketball project.<sup>4</sup> Moreover, by analyzing the types of injuries and integrating relevant cases, it can provide important reference for similar injuries and diseases in the future. Participants have the awareness of actively participating in all-round training, so as to improve their physical quality and basketball skills. Under the guidance of a reasonable sports training system, the hidden danger of sports injury can be effectively reduced.<sup>5</sup> The existing training system includes a series of targeted training to reduce the disadvantages of their own weak links. Basketball has a high demand on the balance of players, whether offensive or defensive. Excellent balance ability can make athletes gain great benefits in actual combat. The basketball game lasts for a long time and has a strong confrontation, which consumes a lot of physical energy. With the competition going on, the balance force receptor of athletes has a greater influence.<sup>6</sup> The impact on athletes with excellent balance will be much smaller. Therefore, the daily balance training is conducive to the athletes' on-the-spot play and can effectively affect the competition trend.<sup>7</sup> Exploring the methods of balance training is also crucial for improving basketball skills.<sup>8</sup>

## METHOD

### Investigation on injury risk of basketball

The research purpose of this paper is to discuss the injury risk of basketball, and to study the improvement of balance training on athletes' body balance, as well as the effect of prevention of sports injury. The study and all the participants were reviewed and approved by Ethics Committee of Guangdong Ocean University (NO.GDOUY20-FN045). Therefore, the first step of this paper is to investigate the existing injury risk of basketball. The article uses the method of questionnaire, from the freshman to the fourth year of a university to the basketball special student athletes, selects 90 people who have had sports injuries as the survey objects, and issues relevant questionnaires. A total of 90 questionnaires were distributed and 90 questionnaires were recovered, including 55 acute sports injuries and 25 chronic sports injuries. Excel software was used to collate and analyze the data obtained.

### Research on Balance Training of Basketball

After clarifying the current sports risks, the author believes that it is extremely necessary to effectively prevent sports risks. Therefore, this paper studies the effect of balance training on the prevention of sports injuries. According to the form of voluntariness, 40 basketball players were selected from the college basketball students. They were randomly divided into the experimental group and the control group, with 20 students in each group. The differences between the experimental group and the control group in age, height, weight, basketball training years, basketball performance, etc. are not significant, which will not interfere with the experimental results.

The experiment was conducted in the form of a control experiment, in which the experimental group used balance training, and the control group chose ordinary physical training as a control. The duration of each training is one hour, and the experiment lasts for 9 weeks. During the 9 weeks, the basic conditions of the experimental group and the control group were consistent in other aspects, so as to minimize the interference of irrelevant variables on the experimental results.

When discussing the effect of balance training on the prevention of sports injury risk, the commonly used FMS test method was selected. Before and after the experiment, the dynamic balance ability and FMS

score of the athletes in the experimental group and the control group were tested respectively, and the data results were collated and analyzed. Excel software and SPSS software were used to extract and summarize the data, and their T and P values were calculated, so as to compare with those within and between groups.

## RESULTS

### Investigation results of injury risk in basketball

In terms of sports injury risk survey, 90 questionnaires were distributed and recovered in the way of questionnaire survey, including 55 athletes with acute sports injury and 25 athletes with chronic sports injury. The situation of injury sites is shown in Figure 1 and Figure 2.

As shown in Figure 1, acute sports injuries of basketball players. From the point of injury location, the most common part of acute injury is the ankle, and 30 athletes were injured as a result. The second is the knee. There are 15 athletes with this injury. Again, the number of athletes in shoulder joints, wrists and spine is relatively small. The research results show that acute injuries mainly occur in the lower limbs of athletes, mainly due to fierce confrontation or insufficient warm-up before sports. Therefore, in the process of sports, we should consciously prepare for warm-up activities, and try to reduce fierce confrontation.

As shown in Figure 2, the chronic injuries of basketball players are mainly concentrated in the knee joint from the point of view of the injured parts, and 17 players have experienced such injuries, accounting for 74%. The second is the spine and shoulders, and the proportion of chronic injuries in ankle and wrist joints is low. The results show that chronic sports injury is mainly caused by long-term strain, and there are two main situations: one is that some movements of athletes are not standardized, and long-term exercise will bring chronic adverse

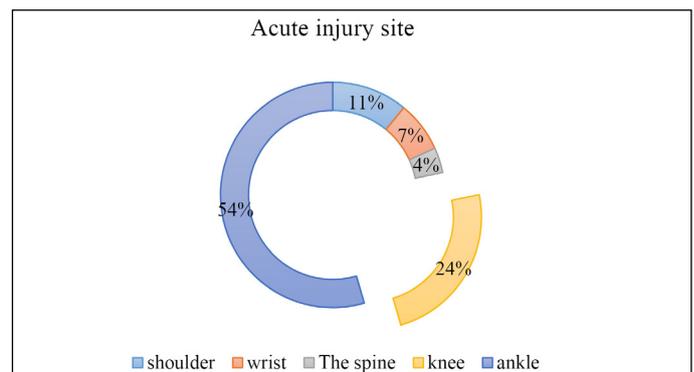


Figure 1. Analysis on acute sports injury of basketball players.

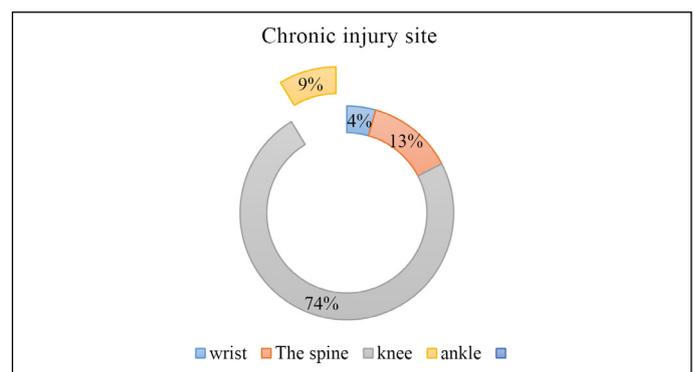


Figure 2. Analysis of chronic sports injuries of basketball players.

effects on the body; The other is that the athletes' body movements are standardized, but the exercise load is too high. If the pressure on the knee joint is higher than the maximum that it can withstand in the long run, chronic injury will occur. Therefore, in the process of basketball, we should correct their actions in time, control the athletes' sports load, scientifically arrange training plans, and minimize the occurrence of chronic injuries.

### Effect of balance training on the balance ability of basketball players

As shown in Section 3.2, the eight point star method is used to measure the effect of improving the balance ability of athletes. As shown in Table 1, the dynamic balance ability of the control group changes. As shown in Table 2, the dynamic balance ability of the experimental group changes. The data is presented in the form of a percentage system.

As shown in Table 1, in order to measure the dynamic balance ability changes of the control group using the eight point star method, overall, balance training improved the dynamic balance ability of the control group.

As shown in Table 2, in order to measure the changes in the dynamic balance ability of the experimental group using the eight point

**Table 1.** Analysis on the change of dynamic balance ability in the control group -- eight point star method.

Direction	Group	Left leg support (%)	Right leg support (%)	T	P
Front	Pre test	68.326 ±5.412	72.692 ±5.836	1.2742	0.5514
	Post test	68.822 ±4.567	72.875 ±6.388		
Outer anterior	Pre test	61.626 ±9.132	65.371 ±5.729	1.4668	0.5465
	Post test	63.006 ±10.161	65.476 ±10.171		
Outside	Pre test	48.092 ±9.705	49.959 ±4.332	1.6567	0.4437
	Post test	49.384 ±3.583	51.930 ±6.224		
Outer posterior	Pre test	66.869 ±2.557	68.644 ±10.925	1.5438	0.4256
	Post test	68.552 ±8.504	71.929 ±7.021		
After	Pre test	78.034 ±4.281	79.907 ±11.806	1.2121	0.4237
	Post test	75.791 ±6.234	79.201 ±9.849		
Interior posterior	Pre test	83.963 ±9.080	85.250 ±8.491	1.2121	0.4237
	Post test	81.319 ±9.853	83.909 ±4.159		
Within	Pre test	76.603 ±7.874	78.550 ±13.678	1.1571	0.2321
	Post test	77.942 ±8.452	79.599 ±7.960		
Anteromedial	Pre test	72.519 ±7.487	74.130 ±6.340	1.5124	0.3124
	Post test	70.567 ±4.554	71.360 ±7.450		

**Table 2.** Analysis of the Dynamic Balance Ability of the Experimental Group -- Eight point Star Method.

Direction	Group	Left leg support (%)	Right leg support (%)	T	P
Front	Pre test	66.889 ±6.522	68.483 ±7.198	1.8884	0.0243
	Post test	90.904 ±10.042	93.200 ±13.011		
Outer anterior	Pre test	64.153 ±6.105	66.940 ±8.493	1.8367	0.0366
	Post test	87.538 ±11.096	91.151 ±13.154		
Outside	Pre test	52.168 ±5.707	51.049 ±6.554	1.1622	0.0315
	Post test	77.233 ±9.545	51.930 ±11.046		
Outer posterior	Pre test	66.324 ±7.791	69.407 ±6.073	1.0552	0.0159
	Post test	92.172 ±10.203	93.251 ±11.777		
After	Pre test	79.016 ±6.126	77.849 ±3.380	1.2169	0.0030
	Post test	103.700 ±10.320	104.312 ±12.866		
Interior posterior	Pre test	83.912 ±6.126	83.160 ±7.566	0.9978	0.0416
	Post test	105.509 ±10.780	108.145 ±12.730		
Within	Pre test	74.740 ±5.230	76.769 ±6.482	1.4420	0.0377
	Post test	99.845 ±9.303	98.459 ±11.181		
Anteromedial	Pre test	74.086 ±6.419	73.549 ±5.922	1.0390	0.0336
	Post test	96.061 ±11.613	95.774 ±13.544		

star method, it can be seen from the intra group comparison that the dynamic balance ability of the athletes in the experimental group has been significantly improved.

A comprehensive comparative analysis of the experimental group and the control group shows that:

① The physical quality and function of the players themselves are good, so for basketball players, although they have improved, the overall improvement is not large.

② Whether the balance training method is adopted or the traditional physical training method is adopted, it is helpful to improve the balance ability of athletes, which also proves the importance of sports training for the optimization of balance ability.

### Preventive effect of balance training on sports injuries of basketball players

In order to discuss the effect of balance training on the prevention of basketball players' sports injuries, it is not enough to optimize the balance ability, but also more systematic analysis. In this paper, FMS test is selected as a comprehensive evaluation standard for the effect of sports injury prevention. Table 3 shows the change of FMS scores of the control group, and Table 4 shows the change of FMS scores of the experimental group. The experimental data are presented in the form of three point system and total point system.

As shown in Table 3, in order to measure the change in the prevention effect of sports injury in the control group by using FMS indicators, balance training improves the FMS score of the control group and reduces the risk of sports injury.

As shown in Table 4, in order to measure the change in the effect of sports injury prevention in the experimental group by using FMS indicators, it can be seen from the intra group comparison that the FMS score of the athletes in the experimental group has been significantly improved.

A comprehensive comparative analysis of the experimental group and the control group shows that:

① The total scores of the two groups were improved before and after the sports training, and the FMS score of the control group was raised from (14.717 ± 1.856) to (15.155 ± 1.529), which achieved a certain improvement, but P>0.05, indicating that there was no significant difference.

**Table 3.** Analysis of FMS score change in control group.

Option	Before experiment	After experiment	T	P
Squat	2.165 ±0.734	2.107 ±0.683	1.0157	0.3365
Hurdle step	2.154 ±0.715	1.950 ±0.518	1.9452	0.0833
Straight Lunge Squat	2.154 ±0.828	2.121 ±0.289	0.3712	0.7214
Shoulder flexibility	2.075 ±0.517	2.107 ±0.517	0.0000	1.0142
Straight knee lift	2.065 ±0.802	2.631 ±0.518	-2.6197	0.0263
Torso stability	1.817 ±0.387	1.950 ±0.288	-1.0197	0.3365
Rotational stability	2.245 ±0.630	2.279 ±0.459	0.0000	1.0217
Total score	14.717 ±1.856	15.155 ±1.529	-0.8022	0.4370

**Table 4.** Analysis of FMS score change in experimental group.

Option	Before experiment	After experiment	T	P
Squat	2.165 ±0.591	2.279 ±0.459	-1.0157	0.3365
Hurdle step	1.906 ±0.784	2.712 ±0.498	-4.2458	0.0020
Straight Lunge Squat	2.065 ±0.668	2.804 ±0.449	-3.0246	0.0130
Shoulder flexibility	1.995 ±0.608	1.934 ±0.517	0.0000	0.6836
Straight knee lift	2.065 ±0.518	2.468 ±0.681	-2.3913	0.0395
Torso stability	2.065 ±0.665	2.712 ±0.486	-4.0015	0.0020
Rotational stability	2.075 ±0.681	2.785 ±0.459	0.0000	0.0051
Total score	14.387 ±2.105	17.694 ±1.398	-6.7448	0.0000

② The total score of FMS in the experimental group increased from (14.387 ± 2.105) to (17.694 ± 1.398), which was much higher than that in the experimental group. P<0.01 showed that there was a very significant difference.

## DISCUSSION

Balance is divided into dynamic balance and static balance. The exercise of dynamic balance can make athletes keep the relative balance of their bodies in the process of sports. For the basketball project, dynamic balance exercise can be carried out through dribbling practice and defensive footstep traverse. Because of the particularity of basketball, these two training methods are more targeted. The strengthening of dynamic balance helps athletes to effectively maintain the relative balance of their limbs under different body postures. Static balance can be practiced by standing on one leg or with the aid of assistive equipment. For example, basic rope skipping exercises and one-sided leg rope skipping exercises. On the basis of targeted training, balance training is combined with core strength training of waist and abdomen. Strengthening waist and abdomen strength plays a decisive role in improving balance. The range of training intensity changes with the enhancement of self balance ability. Avoid low training intensity, resulting in inefficient training. Or the strength is too high, causing fatigue damage to the body.

## CONCLUSION

Athletes' sports injury is an inevitable topic in sports training. Whether it is acute sports injury in fierce confrontation or chronic sports injury in long-term training, it will have a certain negative impact on athletes' competitive level, sports mentality and sports ability, and may even make athletes bid farewell to the competition field in serious cases. Therefore, avoiding the risk of sports injury as much as possible in the process of sports training is a key point in the process of basketball players' sports training. In this paper, the control experiment is used to analyze the role of balance training in avoiding the risk of sports injury. The research results show that the method proposed in this paper can effectively improve the dynamic balance ability of athletes, and improve their FMS test scores, so that athletes can reduce the risk of sports injury in the process of sports, and maintain a better physical state in the process of confrontation as far as possible. In the actual sports process, we should combine balance training with daily training, scientifically design the training plan of athletes, and carefully prepare for protection and relaxation activities before and after the start of sports, so as to reduce the risk of sports injury of athletes as much as possible and promote the improvement of athletes' competitive level.

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All authors declare no potential conflict of interest related to this article

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**AUTHORS' CONTRIBUTIONS:** The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Dayao Zhang and Feng Wu: writing and execution.

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