

# BALANCE TRAINING AND PHYSICAL ABILITY OF BASKETBALL PLAYERS



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TREINAMENTO DE EQUILÍBRIO E HABILIDADE FÍSICA DOS JOGADORES DE BASQUETEBO

ENTRENAMIENTO DEL EQUILIBRIO Y LA CAPACIDAD FÍSICA DE LOS JUGADORES DE BALONCESTO

Guo Lin<sup>1</sup>   
(Physical Education Professional)

1. Beijing University of Posts and Telecommunications, Physical Education Department, Beijing, China.

## Correspondence:

Guo Lin  
Beijing, China. 100876.  
lynda0321@163.com

## ABSTRACT

**Introduction:** Balance in gait is a fundamental factor for rhythmic changes on the court, and physical fitness is a basic requirement for competitiveness in basketball. **Objective:** Analyze the effects of balance training on the gait and physical fitness of basketball players. **Methods:** Thirty basketball athletes were selected and randomly divided into a control and experimental group. A balance training program including balls was added to the experimental group, while the control group followed only the traditional training program. The experiment lasted 8 weeks, with the interventions applied 3 times a week. Finally, relevant data collected before and after the experiment were statistically analyzed and discussed. **Results:** The experimental and the control groups showed a statistical gain in balance, with a greater change interval in the experimental group, demonstrating the effect of dynamic balance training in improving basketball-related physical indices. **Conclusion:** There are some deficiencies in the traditional basketball training program that can be compensated with the addition of the balance training program presented in this article, fully improving the skills of basketball players. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Postural Balance; Basketball; Gait Analysis.

## RESUMO

**Introdução:** O equilíbrio na marcha é um fator fundamental para as alterações rítmicas na quadra, sendo a aptidão física um requisito básico para a competitividade no basquetebol. **Objetivo:** Analisar os efeitos do treinamento de equilíbrio sobre a marcha e a capacidade física dos jogadores de basquetebol. **Métodos:** Foram selecionados 30 atletas de basquetebol, divididos aleatoriamente em grupo controle e experimental. Ao grupo experimental, foi adicionado um programa de treinamento de equilíbrio incluindo o uso de bolas enquanto o grupo controle seguiu apenas com o programa tradicional de treinamento. O experimento teve duração total de 8 semanas, sendo as intervenções aplicadas 3 vezes por semana. Ao final, dados relevantes coletados antes e depois do experimento foram analisados estatisticamente e discutidos. **Resultados:** Tanto o grupo experimental quanto o grupo controle mostraram um ganho estatístico de equilíbrio, sendo maior o intervalo de alteração no grupo experimental, demonstrando o efeito do treinamento de equilíbrio dinâmico na melhoria dos índices físicos relacionados ao basquetebol. **Conclusão:** Existem algumas deficiências no programa de treinamento tradicional de basquetebol que podem ser compensadas com a adição do programa de treinamento em equilíbrio apresentados nesse artigo, melhorando integralmente as habilidades dos jogadores de basquetebol. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Equilíbrio Postural; Basquetebol; Análise da Marcha.

## RESUMEN

**Introducción:** El equilibrio en la marcha es un factor fundamental para los cambios de ritmo en la cancha, siendo la aptitud física un requisito básico para la competitividad en el baloncesto. **Objetivo:** Analizar los efectos del entrenamiento del equilibrio sobre la marcha y la condición física de los jugadores de baloncesto. **Métodos:** Se seleccionaron 30 atletas de baloncesto, divididos aleatoriamente en un grupo de control y otro experimental. Al grupo experimental se le añadió un programa de entrenamiento del equilibrio que incluía el uso de pelotas, mientras que el grupo de control siguió sólo con el programa de entrenamiento tradicional. El experimento tuvo una duración total de 8 semanas, y las intervenciones se aplicaron 3 veces por semana. Al final, se analizaron y discutieron estadísticamente los datos relevantes recogidos antes y después del experimento. **Resultados:** Tanto el grupo experimental como el de control mostraron una ganancia estadística en el equilibrio, con un mayor intervalo de cambio en el grupo experimental, lo que demuestra el efecto del entrenamiento del equilibrio dinámico en la mejora de los índices físicos relacionados con el baloncesto. **Conclusión:** Existen algunas deficiencias en el programa tradicional de entrenamiento de baloncesto que pueden ser compensadas con la adición del programa de entrenamiento de equilibrio presentado en este artículo, mejorando integralmente las habilidades de los jugadores de baloncesto. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptorios:** Equilíbrio Postural; Baloncesto; Análisis de la Marcha.



## INTRODUCTION

Since the development of modern basketball, there has been a fairly mature training system for the training of basketball players. The purpose of the training has been very clear. Develop the physique and physical ability of basketball players in an all-round way. Improve the basketball related skills of athletes.<sup>1</sup> Tap the physical talent and potential of young athletes. Improve the players' tactical accomplishment and enhance the players' tactical execution. Among them, the main purpose is to improve the players' technical level, speed, strength, balance, reaction and other physical conditions.<sup>2</sup> As the basis for athletes to learn the quality and quantity of new technologies and improve the level of sports. Through all-round training, the players' ability is improved, which indirectly enhances the competitiveness and antagonism of basketball.<sup>3</sup> Under the guidance of a reasonable training system, the peak period of sports of athletes is prolonged, and the hidden dangers of injuries and injuries of athletes are reduced. Moreover, the daily high-intensity training has cultivated the strong willpower of the athletes. General training is aimed at increasing the health of athletes and improving their physical functions. Special training is more targeted.<sup>4</sup> Through special training, the specific ability of athletes can be improved, and the style of athletes can be clearly defined, which is conducive to the Tactical Guidance of coaches. In the basketball game, the rhythm of the game is fast and changeable. Physical confrontation is the foundation, and adapting to the rhythm of the game determines the trend of the game. The ultimate goal of athletes is to improve their rhythm adaptability and physical fitness through daily training.<sup>5</sup> In the court, the most intuitive rhythm change of basketball is the gait adjustment ability of athletes. Through the gait change of combination of virtual and real, you can disrupt the rhythm of the other side and enter the appropriate rhythm of our tactics. And physical fitness is the most basic requirement for the competitiveness of all sports. Therefore, through balance training, improve the athletes' gait adjustment ability and physical fitness, and ultimately affect the trend of the game, which is a problem that needs to be further studied in the basketball project.<sup>6</sup>

## METHOD

First of all, select a suitable research object, which requires that the research object not only has good sports ability, but also has a certain room for improvement, and there is little difference between their achievements. Therefore, this paper selects 30 basketball special athletes in sophomore year of a certain university, whose sports scores are 30% ~ 50% of the grade, with little difference in scores and a certain room for improvement. The study and all the participants were reviewed and approved by Ethics Committee of Beijing University of Posts and Telecommunications (NO.2021BJUPTS07). According to the method of drawing lots, they were divided into the experimental group and the control group, with 15 athletes in each group. The age, height and weight of the athletes are shown in Table 1.  $P > 0.05$ , indicating that there is no significant difference, so as to eliminate the interference of different research objects on the experimental results.

15 minutes before the end of each basketball training, the experimental group adopted the balance training program with and without balls, while the control group continued the traditional basketball training program currently in progress, three times a week, lasting for 8 weeks.

**Table 1.** Basic information of the experimental group and the control group.

Option	Control group (15 people)	Experimental group (15 people)	P
Age	20.926±0.503	20.926±0.760	0.0665
Height (cm)	182.158±3.238	187.934±4.108	0.0987
Weight (kg)	79.945±8.390	80.208±9.526	0.0812

In addition to the balance training, other courses of the athletes in the experimental group and the control group were conducted simultaneously during the 8 weeks. The training duration and training content were basically the same, so as to reduce the interference of irrelevant factors as much as possible.

Finally, the measurement of experimental data. In the aspect of gait testing, the portable gait analyzer was selected as the experimental equipment, and the gait parameters were collected and counted. In the test of athletes' balance index, the balance measuring instrument is selected as the experimental equipment to explore the distance of athletes' forward and backward movement and left and right movement in the process of balance measurement. In the aspect of physical fitness improvement, we chose the in-situ take-off, approach take-off, 3 / 4 field sprint and 15m × 17 turn back run and other four indicators, which are also physical indicators closely related to basketball. Through the changes of these four indicators, we can analyze the changes of basketball specific physical fitness.

## RESULTS

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

For basketball, the stronger the ability of gait adjustment in the process of sports, the more favorable it is for athletes to adjust their actions according to the form of the field, so as to master the dominant power of the field. Therefore, before and after the beginning of the experiment, the gait of the athletes in the experimental group and the control group were statistically analyzed.

Table 2 shows the gait comparison between the experimental group and the control group before the experiment. From the figure, it can be seen that there is little difference between the two groups. It can be seen that there is not too much difference in physical fitness and gait performance between the two groups before the experiment, which proves the preciseness of the experiment.

Table 3 shows the gait comparison between the experimental group and the control group after the 8-week gait training experiment. It can be seen from table 3 that there is a significant difference in gait between the experimental group and the control group. In terms of gait frequency, stride length and other aspects, the experimental group is slightly better than the control group. In terms of gait stability, the experimental group is also slightly better than the control group.

**Table 2.** Gait comparison between the experimental group and the control group before the experiment.

Project	Control group	Experimental group	P
Step cycle (s)	1.088±0.102	1.051±0.634	0.9756
Pay (m)	1.255±0.162	1.212±0.297	0.6768
Step Shob (m/s)	1.447±0.939	1.385±1.774	0.7238
Step/min	106.973±14.828	107.957±15.058	0.6705
Initially proportion (%)	1.538±0.255	1.486±0.595	0.6806
The proportion of load-bearing reactions (%)	11.004±0.899	10.263±1.868	0.9591
The proportion of support phase in the middle period (%)	18.762±2.206	19.002±2.389	0.6533
Support phase -end period (%)	17.705±1.936	17.285±2.006	0.9727
Plastic proportion (%)	11.151±1.671	11.152±2.007	0.8398
Support phase ratio (%)	60.321±2.077	60.620±2.643	0.6499
Single lower limb support ratio (%)	37.378±1.275	38.321±1.566	0.9238
Double limbs support (%)	23.718±1.671	22.765±2.427	0.8447
Pumping acceleration (g) thigh	1.158±0.285	1.036±1.244	0.9052
Black thigh (G)	0.774±0.160	0.758±0.399	0.6689
Ground shock (G)	1.588±0.336	1.449±0.759	0.9608
Foot -to -ground angle (°)	24.140±8.667	24.349±9.003	0.8280

**Table 3.** Gait comparison between the experimental group and the control group after the experiment.

Project	Control group	Experimental group	P
Step cycle (s)	1.178±0.102	1.168±0.112	0,0455
Pay (m)	1.305±0.132	1.315±0.132	0,0460
Step Shob (m/s)	1.141±0.190	1.172±0.170	0,0221
Step/min)	101.651±11.704	103.462±9.213	0,0227
Initially proportion (%)	1.368±0.194	1.408±0.122	0,0348
The proportion of load-bearing reactions (%)	10.453±1.188	10.841±1.358	0,0227
The proportion of support phase in the middle period (%)	21.510±3.046	20.611±1.943	0,0290
Support phase -end period (%)	16.370±3.138	16.637±2.568	0,0296
Plastic proportion (%)	12.648±2.007	12.486±1.849	0,0277
Support phase ratio (%)	62.478±2.247	62.059±2.456	0,0396
Single lower limb support ratio (%)	38.855±1.433	39.240±1.315	0,0374
Double limbs support (%)	24.446±2.531	24.639±2.629	0,0220
Pumping acceleration (g) thigh	1.438±1.834	1.827±2.496	0,0380
Black thigh (G)	0.785±0.290	0.683±0.250	0,0346
Ground shock (G)	1.588±0.408	1.588±0.438	0,0479
Foot -to -ground angle (°)	24.268±8.707	26.018±12.222	0,0208

### Effect of balance training on dynamic balance and physical indexes of basketball players

For young basketball players, the goal of all training is to improve sports performance. Therefore, the effect of special physical fitness improvement of basketball players is a very important link. In this regard, the specific summary is also carried out in two aspects: the special physical fitness of single basketball and the special physical fitness of team basketball, as shown in Table 3.

Table 4 shows the comparison of relevant indexes between the experimental group and the control group before the experiment. It can be seen from the data that the basic conditions of the experimental group and the control group are almost the same, and the scores are slightly different, but they are kept in the same ladder as a whole. This also proves that the results of the experimental group and the control group are not different, thus reducing the interference caused by the original performance factors of the subjects. (Table 5)

It can be seen from the physical indexes that in the control group, the touch height of in-situ take-off was increased from (316.660 ± 7.629) cm to (315.901 ± 6.910) cm before the experiment, the touch height of run-up take-off was increased from (322.478 ± 7.266) cm to (319.530 ± 6.371) cm, and the sprint time of 3 / 4 field was shortened from (3.375 ± 0.143) s to (3.339 ± 0.168) s, 15m × 17. The turn back running time was shortened from (73.765 ± 7.219) s before the experiment to (70.526 ± 5.526) s. In the experimental group, the height of the in-situ take-off model was increased from (318.188 ± 6.610) cm to (319.138 ± 6.643) cm before the experiment, the height of the run-up take-off model was increased from (322.882 ± 6.949) cm to (321.926 ± 6.910) cm, and the sprint time of 3 / 4 field was shortened from (3.325 ± 0.112) s to (3.289 ± 0.148) s, 15m × 17. The turn back running time was shortened from (70.810 ± 7.609) s before the experiment to (67.389 ± 7.157) s. It shows that both the experimental group and the control group show a relatively obvious rising state, and the range of change in the experimental group is larger than that in the control group, thus proving the effect of dynamic balance training on the improvement of basketball related physical indexes of basketball players.

**Table 4.** Comparison of dynamic balance and physical indexes between the experimental group and the control group before the experiment.

Measurement project	Control group	Experimental group	P
Follow -up distance (mm)	1846.442±495.631	1939.655±538.892	0.0235
Left and right to move distance (mm)	1954.828±691.065	1860.021±758.778	0.0366
High jumping in place (cm)	316.660±7.629	318.188±6.610	0.0275
Helping running and jumping high (cm)	322.478±7.266	322.882±6.949	0.0388
3/4 venue sprint and run (s)	3.375±0.143	3.325±0.112	0.0486
15m × 17 running back (s)	73.765±7.219	70.810±7.609	0.0492

**Table 5.** Comparison of dynamic balance and physical indexes between the experimental group and the control group after the experiment.

Measurement project	Control group	Experimental group	P
Follow -up distance (mm)	1827.930±492.256	1327.190±636.405	0.0500
Left and right to move distance (mm)	1954.877±695.866	1431.579±763.936	0.0456
High jumping in place (cm)	315.901±6.910	319.138±6.643	0.0486
Helping running and jumping high (cm)	319.530±6.371	321.926±6.910	0.0385
3/4 venue sprint and run (s)	3.339±0.168	3.289±0.148	0.0400
15m × 17 running back (s)	70.526±5.526	67.389±7.157	0.0425

## DISCUSSION

American professional basketball has the most advanced basketball training system in the world. Their basic balance training starts with the routine rope skipping. Warm up before the game: quickly find the balance through the balance practice of rope skipping. This situation has been very common through the media. Through the in-depth study of sports principles, it can be found that balance training first promotes the dynamic balance of athletes. The dynamic balance force can control the overall center of gravity of the body during the exercise. Maintaining dynamic stability between travels. For the basketball project, the difficulty of balance control in the process of holding the ball is far greater than the daily technical actions such as running and jumping. Daily balance training can help athletes find a sense of balance through gait adjustment in a difficult state. The length of the stride and the frequency of the stride can directly affect a player's sense of balance when holding or without the ball. Moreover, the sense of balance in basketball is equally important to the attacking side and the defending side. An excellent scorer can disrupt the opponent's defensive steps and rhythm through his own gait changes. Better athletes can even rely on their own gait rhythm changes to disrupt the opponent's overall defensive tactical system. For the defender, balance training can improve the rhythm and adaptability of the defender. Under the scientific balanced training, we can train excellent defensive basketball players. An excellent defender can quickly make adjustments according to the gait changes of the attacking side in a short time. The shorter the reaction time, the less likely it is to be scored successfully by the other side. Therefore, balance training can improve the athletes' gait adjustment ability and play a more important role in defense. Secondly, balance training is also helpful for the gait coordination of basketball players. Balance training can make the movement of athletes more smoothly and the competition efficiency more efficient. Therefore, daily balance training is an important means to improve the gait adjustment and coordination of players.

## CONCLUSION

From the experimental results, it can be seen that the existing sports training can better optimize the basketball related physical indicators

of athletes, but the effect of gait adjustment and dynamic balance ability optimization is not strong. After joining the balance training, the gait of the athletes has been well adjusted, and the balance index has been optimized. After joining the dynamic balance training, the change range of the basketball related physical indexes of the athletes is also more optimized than the traditional sports training. This shows that the existing basketball training program can also improve the functions of

basketball players in all aspects, but there are still some deficiencies. The addition of balanced training can make up for the shortcomings in this aspect, and thus comprehensively promote the improvement of basketball players' abilities in all aspects.

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