

# IMPROVEMENT OF SPEED AND EXPLOSIVE STRENGTH IN SOCCER PLAYERS



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APERFEIÇOAMENTO DE VELOCIDADE E FORÇA EXPLOSIVA EM JOGADORES DE FUTEBOL

MEJORA DE LA VELOCIDAD Y LA FUERZA EXPLOSIVA EN JUGADORES DE FÚTBOL

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

1. Pingdingshan University,  
Institute of Physical Education,  
Pingdingshan, Henan, China.

## Correspondence:

Gao Feng  
Pingdingshan, Henan, China.  
467000.  
dianfeng0321@163.com

## ABSTRACT

**Introduction:** Besides good physical condition, soccer players should also possess good technical and psychological abilities. Physical fitness is a crucial factor in the competitive ability improvement of soccer players. **Objective:** Explore the improvement of running speed and explosive strength in soccer players. **Methods:** We selected 30 soccer players by random sampling. Individuals were randomly divided into experimental and control groups. Members of both groups participated in daily physical activities, and speed and strength training was added to the experimental group through a protocol with regular exercises. The athletes trained for ten weeks. The speed and explosiveness of the athletes were measured before and after the test. A mathematical and statistical analysis was made of the data collected. **Results:** There were significant differences in running speed and explosiveness strength in the athletes of the experimental group compared to the control group in the 30-meter dash, long jump, and Illinois run. **Conclusion:** Speed and strength exercises can significantly improve the running speed of athletes, and increase the muscular explosive force and physical agility of soccer players. The speed and strength exercises developed in this paper are consistent with the technical characteristics of soccer. These results can lay the foundation for future daily training planning and project work in soccer teams. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Soccer; Athletes; Running; Resistance Training.

## RESUMO

**Introdução:** Além de boa condição física, os jogadores de futebol também devem possuir uma boa capacidade técnica e psicológica. A aptidão física é um fator crucial para o aprimoramento da capacidade competitiva nos jogadores de futebol. **Objetivo:** Explorar o aprimoramento da velocidade de corrida e a força explosiva dos jogadores de futebol. **Métodos:** Selecionou-se 30 jogadores de futebol por amostragem aleatória. Os indivíduos foram divididos aleatoriamente em grupos experimental e controle. Os membros de ambos os grupos participaram de atividades físicas diárias e ao grupo experimental foi adicionado um treinamento de velocidade e força através de um protocolo com exercícios regulares. Os atletas treinam durante dez semanas. A velocidade e a explosividade dos atletas foram medidas antes e depois do teste. Fez-se uma análise matemática e estatística dos dados coletados. **Resultados:** Houve diferenças significativas na velocidade de corrida e força de explosão nos atletas do grupo experimental em comparação com o grupo de controle nos 30 metros de corrida, salto em distância e corrida de Illinois. **Conclusão:** Os exercícios de velocidade e força podem melhorar significativamente a velocidade de deslocamento dos atletas, aumentara for explosiva muscular e a agilidade física dos jogadores de futebol. Os exercícios de velocidade e força desenvolvidos neste trabalho são consistentes com as características técnicas do futebol. Estes resultados podem lançar as bases para o futuro planejamento diário de treinamento e trabalho de projeto nas equipes de futebol. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Futebol; Atletas; Corrida; Treinamento de Força.

## RESUMEN

**Introducción:** Además de una buena condición física, los jugadores de fútbol deben poseer una buena capacidad técnica y psicológica. La aptitud física es un factor crucial para la mejora de la capacidad competitiva en los jugadores de fútbol. **Objetivo:** Explorar la mejora de la velocidad de carrera y la fuerza explosiva en jugadores de fútbol. **Métodos:** Se seleccionaron 30 jugadores de fútbol por muestreo aleatorio. Los individuos se dividieron aleatoriamente en grupos experimentales y de control. Los miembros de ambos grupos participaron en actividades físicas diarias y al grupo experimental se le añadió el entrenamiento de velocidad y fuerza mediante un protocolo con ejercicios regulares. Los atletas se entrenaron durante diez semanas. La velocidad y la explosividad de los atletas se midieron antes y después de la prueba. Se realizó un análisis matemático y estadístico de los datos recogidos. **Resultados:** Hubo diferencias significativas en la velocidad de carrera y la fuerza explosiva en los atletas del grupo experimental en comparación con el grupo de control en las pruebas de 30 metros lisos, salto de longitud y carrera de Illinois. **Conclusión:** Los ejercicios de velocidad y fuerza pueden mejorar significativamente la velocidad de carrera de los atletas, aumentar la fuerza explosiva muscular y la agilidad física de los futbolistas.



**Descriptores:** Fútbol; Atletas; Carrera; Entrenamiento de Fuerza.

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## INTRODUCTION

The training focus of the youth football team is to explore and improve the technical quality of young players profoundly. This can lay a good foundation for them to enter the professional team. Currently, the physical fitness evaluation of young players in China is mainly based on the personal evaluation of coaches.<sup>1</sup> It is challenging to conduct a comprehensive and comprehensive assessment of it, which affects its systematic cultivation and screening. Speed and strength training can improve teens' muscular and neural response rates and increase their strength and explosiveness. In football, we can use speed and strength exercises to test their impact on performance.<sup>2</sup> This paper's research results provide a reference for training young football players' speed and physical fitness.

## METHOD

### Research objects

This paper selects 30 players for investigation. We randomly divided 30 subjects into two groups of 15 each. The 30 selected players did not participate in similar sports and sports.

### Training method

Members of both groups participated in daily physical activity. The experimental group also performed speed and strength training and regular exercise. Members undergo ten weeks of training.<sup>3</sup> Athletes' speed and explosiveness were measured before and after the test. The test speed is a short sprint of 30 meters. The test of explosiveness is the standing jump.

### Power simulation of football players when kicking

In this paper, the leg muscles of football players were measured using mechanical sensing technology. This paper establishes a fusion mathematical model of human thigh muscle strength parameters using motion parameter identification and motion state feedback identification technology.<sup>4</sup> According to the simulation structure of the football player's leg muscle contraction, a force model of the football player's leg without rigid restriction is established:

$$\begin{aligned} S &= s \cos \alpha \\ s &= \frac{\sin \alpha (1 + \cos \alpha)}{n \pi E} \\ \beta &= \frac{S_0 - S}{S_0} = \frac{\cos \alpha_0 \sin \alpha - \cos \alpha}{\cos \alpha_0 \sin \alpha} \end{aligned} \quad (1)$$

Formula (1)  $\beta$ ,  $E(E_0)$  refers to the limit parameter of the strength and posture of the football player when kicking.  $S_0$  refers to the initial muscle length.  $S$  refers to actual muscle length.  $\alpha$  refers to the angle of rotation produced by the force the football players are subjected to during the game.  $n$  is an indeterminate constant.<sup>5</sup> Passively adjust the motion step length of the knee joint when the leg unit touches the ground as  $\eta$ . Through the modeling of Simulink model, the force index  $Q$ ,  $Q_e \in R^{6 \times 1}$  of the thigh muscle is obtained. The transfer of power in the thigh muscles of a player on a football field is:

$$dM_{in} = \frac{(Q + Q_e)(Q - Q_e)}{\eta(1 - \beta)} dX \quad (2)$$

$dX$  refers to the change in intramuscular volume.<sup>6</sup> The adaptive weighting coefficient of lower extremity muscle strength is  $w_{1j}, w_{2j}, \dots, w_{nj}$ . In this paper, the motion parameter method is used to identify the motion parameters of football players based on fuzzy parameter constraints:

$$dM_{out} = -F \frac{dM_{in}}{dS} \quad (3)$$

$G$  is the ideal force for muscle output.  $dS$  refers to a change in muscle length. This paper obtains an adaptive-based strength and weakness control method without considering the body position line angle and lateral displacement.

$$\xi = \frac{2\pi E_0^2}{4 \tan^2 \alpha_0 \cot^2 \alpha_0} \lambda = \frac{\pi E_0^2}{4 \sin^2 \alpha_0 \cos^2 \alpha_0} \quad (4)$$

The motion analysis mode of kicking is established by the knee torque characteristic analysis method.<sup>7</sup> In this paper, the football players are excited for a long time in  $R^n$  to obtain the parameter identification mode in the order  $r(k) \in R^n$  of pitch angle and pitch angle rate:

### Data Analysis

This paper uses Spss21.0 to carry out descriptive analysis, paired T-test, correlation analysis, etc.,  $\alpha=0.05$  indicates statistical significance.<sup>8</sup>

### Ethical Compliance

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Pingdingshan University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

## RESULTS

### Summary of test results

Table 1 shows the data collected before and after ten weeks of strength training. According to the difference in the average points between the two groups, this paper found that the changes in the

**Table 1.** Breakdown of changes after speed training and strength training experiments.

	Group	Before experiment	After the experiment	Change value
30m run/s	Test group	4.79±0.58	4.74±0.56	-0.411
	control group	4.77±0.53	4.74±0.56	0.084
Standing long jump/cm	Test group	286.91±17.75	294.56±12.17	12.895
	Control group	285.81±22.2	286.32±26.63	3.421
Illinois agility run/s	Test group	25.66±0.66	27.39±0.71	-0.379
	Control group	28.05±1.2	25.81±1.24	-0.042

30-meter short distance race were more significant.<sup>9</sup> Both groups have made great progress on the stand-up jump, especially in the experimental group. Illinois sensitivity in the experimental group was significantly improved ( $P < 0.05$ ).

### Comparative analysis of the experimental group and the control group before and after the test

#### Comparative analysis of the two groups before and after the test

Before the test, the experimental and control groups' 30-meter running, standing long jump, and Illinois-sensitive running had no significant statistical significance ( $P > 0.05$ ). (Table 2)

#### Comparative analysis of the experimental group and the control group after the test

After speed and strength training, the three performances of 30-meter running, standing long jump, and Illinois agility running in the two groups had significant statistical significance ( $P < 0.05$ ). (Table 3)

#### Comparative study before and after the test

Differences between experimental groups before and after exercise

There was significant statistical significance in the experimental groups of the 30-meter running, standing long jump and Illinois agility running ( $P < 0.05$ ). (Table 4)

#### Comparison of control group before and after exercise

There was no significant difference between the 30-meter run and Illinois run in the control group before and after the exercise ( $P > 0.05$ ). There was a significant difference in the standing long jump scores ( $P < 0.05$ ). (Table 5)

## DISCUSSION

The contraction of muscles is the main driving force of the body. Muscles are central to the coordination of the entire body. The same goes for the other organs of the body. Strength qualities are presented in a variety of ways.<sup>10</sup> The maximum force is the most representative ability. Its training principles can be thought of as a "basic" strength. It can achieve maximum power in two ways. The first method is to increase coordination within the muscles. Football players can significantly improve muscle coordination through special exercises. Exercise does not increase muscle volume. The second method increases their strength by increasing the muscle cross-section.<sup>11</sup> During exercise, the athlete can accelerate the rapid degradation of protein in the body and expand the muscle cross-section. We can take a variety of ways to enhance non-sex abilities while training. Of course, this ability can be divided into many kinds.

The content includes thigh strength, waist strength, upper body strength, etc. Different muscles have different strengths and coordination. If you don't have enough power, the football player's shot can also be caught by the goalkeeper. It is almost impossible for an athlete to shoot on the field. Athletes' physical fitness is essential in confronting opponents.<sup>12</sup> Athletes can take a better position in most competitions. If the athlete does not have enough physical strength, then the possession of the ball will be lost. The strength of the waist is even more critical. Whether shooting or defending, jumping and explosiveness are essential.

Speed quality is a very critical ability. Football training has a growing need for speed. Athletes can gain the upper hand in the shortest possible time. Athletes can gain the upper hand at a faster pace. Reaction rate refers to how quickly the body responds to different signals.<sup>13</sup> Athletes can use a variety of bursts of information to train. Strengthening the central nervous

**Table 2.** Subjects' speed, explosiveness, and agility parameters before speed training and strength training experiments.

Project	Test group	Control group	T	P
30m run/s	4.79±0.58	4.77±0.53	-0.275	0.838
Standing long jump/cm	286.91±17.75	75.28±22.2	0.146	0.938
Illinois agility run/s	25.66±0.66	25.95±1.2	-0.755	0.506

**Table 3.** Subjects' speed, explosiveness, and agility parameters after speed training and strength training experiments.

Project	Test group	Control group	T	P
30m run/s	4.51±0.14	4.74±0.56	0.043	-2.559
Standing long jump/cm	294.56±12.17	75.79±26.63	0.014	7.998
Lino agile run/s	27.39±0.71	25.81±1.24	0.023	-3.178

**Table 4.** Parameters of speed, explosiveness, and agility of subjects in the speed training and strength training experimental groups before and after the experiment.

Project	Before experiment	After the experiment	T	P
30m run/s	4.79±0.58	4.51±0.14	-2.471	0.035
Standing long jump/cm	286.91±17.75	294.56±12.17	8.438	0.008
Illinois agility run/s	25.66±0.66	27.39±0.71	4.505	0.031

**Table 5.** Speed, explosiveness, and agility parameters before and after the experiment for speed training and strength training control subjects.

Project	Before experiment	After the experiment	T	P
30m run/s	4.77±0.58	4.74±0.56	-0.273	0.859
Standing long jump/cm	286.91±17.75	286.32±26.63	-3.486	0.039
Illinois agility run/s	25.66±0.66	25.81±1.24	0.516	0.677

system and reducing neurotransmission is essential to improving responsiveness. Athletes need to increase the intensity of speed stimuli and correlate movements resulting from different stimuli. Football players strengthen their conditioned reflexes by constantly repeating their exercises. The rate of movement is the rate at which the body moves. For example, starting, kicking, kicking, stepping, etc., can all be in the appropriate preparation stage. This results in a more extensive working range.<sup>14</sup> Athletes need to use the external environment or reduce the weight of the equipment to repeatedly and quickly develop the movement. The exercise method can use short-range repeated running to increase the exercise frequency. This allows the athlete to train as quickly as possible. In the short-distance sprint, all the technical movements of the athletes are carried out through non-lactate. Improving the anaerobic function of non-lactic acid and the synthesis of ATP in the competition is the most critical part of ensuring the competition process.

## CONCLUSION

The exercise of speed and strength is beneficial to improve the athlete's displacement speed, lower body explosiveness, and physical agility. In contrast, the exercise effect of speed and strength is consistent with the technical characteristics of football. Although the explosive strength and speed are achieved overnight, their leg muscles will be quickly exhausted when this explosive style occurs. If they can exercise strength and speed before the game, they can significantly improve their explosiveness and enhance their strength on the field. This is undoubtedly an excellent exercise for them. Due to the transference and provocative nature of sports, athletes should conduct appropriate preparations before exercising.

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

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