

IMPACTS OF TRAINING WITH HIGH LOADS ON EXPLOSIVE STRENGTH IN SOCCER PLAYERS



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IMPACTOS DO TREINO COM CARGAS ELEVADAS SOBRE A FORÇA EXPLOSIVA NOS JOGADORES DE FUTEBOL

IMPACTO DEL ENTRENAMIENTO CON CARGAS ELEVADAS SOBRE LA FUERZA EXPLOSIVA EN FUTBOLISTAS

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ABSTRACT

Introduction: The soccer athlete must complete the confrontation, dribbling, and shooting actions in a short time. This requires a high quality of explosive strength. Training with loads is useful for this purpose, but there still needs to be more evidence of the results of applying high loads. **Objective:** Study the influence of high-load training on the explosive quality of soccer players. **Methods:** Twenty soccer athletes were selected and divided into experimental and control groups. The experimental group completed their training with a high-load protocol added to their daily soccer training. In contrast, the ten control group athletes continued their existing daily training without changes. The experiment lasted six weeks. Pertinent data were collected and statistically analyzed to analyze the intervention results. **Results:** The stationary ball kick distance elevation in the experimental group was 49.74 ± 1.42 m, while that of the control was 46.16 ± 3.01 m, $p < 0.05$. The rate of change in the experimental group was 8.07%, higher than the 1.54% in the control group. **Conclusion:** Introducing the high-load training module into the soccer daily training system can effectively optimize soccer athletes' explosive muscle strength quality, increasing their competitive performance in games. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Soccer; Strength Training; Physical Fitness; Physical Education and Training.

RESUMO

Introdução: O atleta de futebol deve completar as ações de confronto, drible e tiro em um curto espaço de tempo, isso exige uma alta qualidade de força explosiva. O treino com cargas é uma ferramenta útil para esse fim, porém ainda há poucas evidências dos resultados na aplicação de cargas elevadas. **Objetivo:** Estudar a influência do treinamento de cargas elevadas sobre a qualidade explosiva dos jogadores de futebol. **Métodos:** Foram selecionados 20 atletas de futebol, igualmente divididos em grupo experimental e controle. O grupo experimental efetuou seu treinamento com um protocolo de alta carga adicionado ao treinamento diário de futebol, enquanto os 10 atletas do grupo de controle continuaram com o treino diário existente, sem alterações. O experimento durou 6 semanas, os dados pertinentes foram coletados e avaliados estatisticamente para analisar os resultados da intervenção. **Resultados:** A elevação da distância do chute de bola parada no grupo experimental foi de $49,74 \pm 1,42$ m, enquanto a de controle foi de $46,16 \pm 3,01$ m, $p < 0,05$. A taxa de variação no grupo experimental foi de 8,07%, superior aos 1,54% do grupo controle. **Conclusão:** A introdução do módulo de treinamento de cargas elevadas no sistema de treinamento diário de futebol pode efetivamente otimizar a qualidade de força explosiva muscular dos atletas de futebol, aumentando a sua performance competitiva nos jogos. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Futebol; Treinamento de Força; Aptidão Física; Educação Física e Treinamento.

RESUMEN

Introducción: El atleta de fútbol debe completar las acciones de enfrentamiento, regate y tiro en un corto período de tiempo, esto exige una alta calidad de fuerza explosiva. El entrenamiento con cargas es una herramienta útil para este fin, sin embargo, aún existe poca evidencia de los resultados en la aplicación de cargas elevadas. **Objetivo:** Estudiar la influencia del entrenamiento con cargas elevadas en la calidad explosiva de los futbolistas. **Métodos:** Fueron seleccionados 20 atletas de fútbol, divididos equitativamente en grupo experimental y grupo control. El grupo experimental realizó su entrenamiento con un protocolo de altas cargas añadido al entrenamiento diario de fútbol, mientras que los 10 atletas del grupo control continuaron con su entrenamiento diario existente, sin cambios. El experimento duró 6 semanas, se recogieron los datos pertinentes y se estudiaron estadísticamente para analizar los resultados de la intervención. **Resultados:** La elevación de la distancia de lanzamiento de balón estacionario en el grupo experimental fue de $49,74 \pm 1,42$ m, mientras que la del control fue de $46,16 \pm 3,01$ m, $p < 0,05$. El índice de cambio en el grupo experimental fue del 8,07%, superior al 1,54% del grupo de control. **Conclusión:** La introducción del módulo de entrenamiento de alta carga en el sistema de entrenamiento diario de fútbol puede optimizar eficazmente la calidad de la fuerza muscular explosiva de los atletas de fútbol, aumentando su rendimiento competitivo en los partidos. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Fútbol; Entrenamiento de Fuerza; Aptitud Física; Educación y Entrenamiento Físico.



INTRODUCTION

Football has always been a popular sport in the world. The holding of the World Cup has brought great attention to football.¹ However, China's current level of football is low, and it has always been difficult to achieve good results in international competitions. The reason is that there are still some problems in the current football training mode. Modern football has been introduced into China for a short time.² Many professional football teams lack football training experience about the Orientals and can only explore in training. Many football coaches will introduce some western training methods in order to make progress in football training as soon as possible.³ Although these training methods have achieved good results in European and American countries, they may not be suitable for Chinese people's physique, and the results are not very good. Therefore, it is necessary to develop a more suitable training program for Chinese football players.⁴ Football needs to run for a long time on the field, which consumes a lot of physical energy. In addition to running, it also needs to complete confrontation, dribbling, shooting and other actions in a short time, which requires football players to have a high explosive quality.⁵ Although the existing sports training has improved the football endurance, it has insufficient influence on the explosive force. In view of this situation, this paper wants to add a high load training module in the daily training of football players, and make certain progress in the explosive power level of players by increasing the sports load.⁶ On the competition field, we can adjust our own level in time according to the actual situation, and develop strong physical strength.⁷ In this way, we can not only complete short-term confrontation and shooting and other activities, gain the advantage in the score, master more initiative, but also promote the progress of China's football training field.⁸

METHOD

Selection of research objects

This paper selects the football team of a sports school in a city as the research object. The members are about 18 years old and have generally received about 4 years of sports training. The study and all the participants were reviewed and approved by Ethics Committee of Guangdong University of Finance and Economics (NO.GDUFE20DZ4). They have a good foundation of football skills. Their height, weight, age and training years are shown in Table 1.

Experimental design

The experiment adopted the form of control variable, and set the variable as whether to carry out high load training. The 10 athletes in the experimental group added a high load training module in their daily football training, increased the training load and resistance, and exercised their explosive quality. The 10 players in the control group followed the existing daily football training plan. The training plans of the 20 athletes in the experimental group and the control group are the same, and the unified accommodation, diet and rest will not produce too much interference. The whole experiment lasted for 6 weeks. During the experiment, the interference of irrelevant variables was minimized to ensure the preciseness of the experiment.

Table 1. Basic information of two groups of football players.

Before experiment	Height (cm)	Weight (kg)	Age (y)	Training years (y)
Experience group	172.540 ±4.1679	62.939 ±3.6152	18.511 ±1.4274	4.035 ±0.7572
Control group	172.618 ±3.6647	60.534 ±1.7635	18.919 ±1.0466	4.073 ±0.8237
P value	0.0797	0.0742	0.0638	0.0829

Data analysis

When judging and calculating the explosive force index, according to the relationship with football, it can be divided into lower limb explosive force, general explosive force and explosive force related to football. Among them, the explosive force of lower limbs is the most direct factor, which refers to the influence of high load training on the strength of lower limbs of football players. Therefore, the vertical jump height, the maximum strength of squatting and other indicators are selected. The general explosive force is a more detailed study based on the explosive force of the lower limbs. The choice is indirectly related to the athletes' running on the competition field. The factors selected are the standing long jump distance, the run-up takeoff height of the dominant leg, the run-up takeoff height of the inferior leg, the 30 meter sprint time, the T-shaped run time, the run-up feet takeoff height and other indicators. Finally, it is the index directly related to the sports performance, and the index of distance kick of set pieces is selected.

RESULTS

The influence of high load training on the explosive quality of football players' lower limbs

The most direct performance of high load training on the improvement of explosive power is the improvement of athletes' explosive power of lower limbs. Therefore, the vertical jump height and the maximum strength of squat were selected as the change criteria of explosive power quality of lower limbs, which was taken as the first stage of research. (Table 2)

Before the experiment, there was little difference between the experimental group and the control group in the vertical jump height, the maximum strength of squatting and other indicators, $P > 0.05$, indicating that there was no significant difference, which would not affect the experimental results, and it could be compared.

In terms of vertical jump height, after the experiment, the experimental group increased to (43.366 ± 7.0662) cm and the control group increased to (38.456 ± 4.5932) cm, with a p value of $0.0092 < 0.01$. The change rate of the experimental group was 13.25%, much higher than 0.68% of the control group. In terms of the maximum strength of squatting, after the experiment, the experimental group increased to (190.652 ± 12.9640) kg, and the control group increased to (165.793 ± 10.2411) kg, with a p value of $0.0013 < 0.01$. The change rate of the experimental group was 11.89%, much higher than the control group's 3.63%. It can be seen from the comparative analysis of the data that the existing football daily training mode can also improve the explosive power of football players' lower limbs, but the improvement effect is not good enough. After the introduction of high load training into daily football training, the height of vertical jump and the maximum strength of squat of football players have been significantly improved, and formed a sharp

Table 2. The influence of high load training on football players' explosive power quality of lower limbs.

Before experiment	Vertical jump height (cm)	Maximum squatting force (kg)
Experience group	37.618 ±5.7755	167.985 ±12.0774
Control group	38.194 ±3.8909	159.769 ±9.0270
P value	0.0670	0.0624
After experiment	Vertical jump height (cm)	Maximum squatting force (kg)
Experience group	43.366 ±7.0662	190.652 ±12.9640
Control group	38.456 ±4.5932	165.793 ±10.2411
P value	0.0092	0.0013
Rate of change	13.25%/0.68%	11.89%/3.63%

contrast with the control group. This shows that high load training can directly improve the explosive power of athletes' lower limbs, and the optimization effect is obvious.

Impact of high load training on general explosive quality of football players

After studying the most direct indicators of explosive force, the author chooses the standing long jump distance, the take-off height of the approach of the superior leg, the take-off height of the approach of the inferior leg, the 30 meter sprint time, the T-shaped run time, the take-off height of the approach feet and other indicators as the judgment criteria of the general explosive force quality of football players. This is also the deepening of the second stage of research. The selected indicators have a direct or indirect relationship with the football field, and these explosive power can enable athletes to master more initiative in the field.

It can be seen from Table 3 that before the experiment, there was no significant difference between the experimental group and the control group in standing long jump distance, approach take-off height of superior leg, approach take-off height of inferior leg, 30 meter sprint time, T-shaped running time, approach double foot take-off height and other indicators ($P > 0.05$), indicating that there was no significant difference, which can be compared.

Through data comparison, it can be seen that the effect of conventional football training on the improvement of the general explosive power index of athletes is not obvious, and some will even lead to a regression in this regard. Therefore, the common football training programs are not suitable for the players of the football team selected in this paper. By introducing high load training into the football training system, obvious optimization effect can be obtained, which shows that introducing high load training into daily training has a greater role in promoting the general explosive power of the football team players.

The influence of high load training on football players' set piece kick

All sports training is to achieve better results on the field, and football is judged by the number of shots as the score. Therefore, the better the football players' shooting skills and ability to kick the set pieces, the higher the probability of obtaining points and the greater the initiative in the field. Therefore, in the third stage of this paper, the set piece kick far indicator, which has a direct relationship with football, is selected as the judgment standard of explosive force. Three tests were conducted before and after the experiment, and the average value was taken as the kick distance of each athlete, and the data were collated and analyzed to calculate the P value and change rate.

It can be seen from Table 4 that before the experiment, there was no significant difference between the experimental group and the control group in the distance index of set ball kick ($P > 0.05$), indicating that there was no significant difference, which can be compared. After the experiment, the experimental group increased to (49.749 ± 1.4218) m and the control group increased to 46.161 ± 3.0168 m, with a p value of $0.0195 < 0.05$. The change rate of the experimental group was 8.07%, much higher than 1.54% of the control group. Through data comparison, it can be seen that both the experimental group and the control group have good sports literacy, and they have reached a distance of 45 meters before the experiment. After the experiment, the improvement effect of the experimental group is more significant than that of the control group, which shows that adding high load training content in football training can improve the explosive power of athletes' lower limbs in a targeted way, and has a better promotion effect on some key movements in the sports field.

DISCUSSION

Problems in football training

It can be seen from the survey that there are some problems in the current football teaching, which will affect the teaching effect of football, mainly including the following:

1. Lack of confidence in sports: Many athletes and coaches lack confidence in China's football cause. They think that even if they become professional football players and football coaches, they are just a means to make a living without making clear their career plans. This leads to many football players not having to learn hard, and coaches not having to teach hard, so football training is not effective.
2. Lack of football training programs suitable for local players: Many football coaches still copy western training programs when training, and some football clubs

Table 4. The Influence of High Load Training on Football Players' Kicking of Set pieces.

Before experiment	Kick the set ball far (m)
Experience group	45.733 ± 2.2171
Control group	45.450 ± 2.4510
P value	0.0345
After experiment	Kick the set ball far (m)
Experience group	49.749 ± 1.4218
Control group	46.161 ± 3.0168
P value	0.0195
Rate of change	8.07%/1.54%

Table 3. The influence of high load training on the general explosive quality of football players.

Before experiment	Standing long jump (m)	Take off height of dominant leg run-up (cm)	Take off height of inferior leg run-up (cm)
Experience group	2.570 ± 0.0610	67.061 ± 2.0939	62.691 ± 1.5287
Control group	2.591 ± 0.0592	70.384 ± 2.4816	61.774 ± 1.2156
P value	0.0650	0.0508	0.0664
After experiment	Standing long jump (m)	Take off height of dominant leg run-up (cm)	Take off height of inferior leg run-up (cm)
Experience group	2.800 ± 0.0916	74.675 ± 2.0753	74.603 ± 1.4218
Control group	2.580 ± 0.0916	69.607 ± 1.7735	61.943 ± 1.2603
P value	0.0124	0.0260	0.0067
Rate of change	8.20%/-0.40%	10.20%/-1.12%	15.97%/0.27%
Before experiment	30 meter dash (s)	T-run (s)	Jump height of approach feet (cm)
Experience group	4.128 ± 0.0712	9.419 ± 0.2779	61.356 ± 4.3734
Control group	4.095 ± 0.0790	9.549 ± 0.2757	62.022 ± 4.0452
P value	0.0660	0.0842	0.0955
After experiment	30 meter dash (s)	T-run (s)	Jump height of approach feet (cm)
Experience group	3.677 ± 0.0814	8.435 ± 0.1316	70.879 ± 3.5841
Control group	4.069 ± 0.0712	9.797 ± 0.2192	62.571 ± 3.8206
P value	0.0469	0.0360	0.0309
Rate of change	-12.28%/-0.65%	-11.67%/2.54%	13.44%/0.88%

will invite foreign coaches and star players to help. This makes the whole training system have the problem of praising the western teaching mode and ignoring the local talent training, which makes the phenomenon that the sports training program does not match the actual physical condition of athletes more obvious.

Development direction of football training

In view of the problems raised above, combined with the research results of this paper, the author believes that the following points should be paid attention to in the future football training in China: (1) Clear goals and build confidence: Coaches should formulate phased goals according to the actual situation of athletes and teams, and strive to make new progress in sports level every month, and each competition can make further progress in the existing results. Only by defining the goals that can be achieved in stages, can we gain joy in progress again and again, re-establish professional values and professional pride, and stimulate the self-confidence and enthusiasm of athletes and coaches. (2) Choose a local training mode more suitable for Chinese athletes: There are obvious ethnic differences between Chinese and Westerners, so the western sports football training mode cannot be completely copied to China.

CONCLUSION

At present, there are still many problems in China's football training system, which needs to be scientifically combined with the actual situation of Chinese athletes to improve the sports training program. In this paper, the high load training is introduced into the football training system to study its optimization effect on the explosive quality of athletes. The research results show that the introduction of the high load training module into the daily football training system can effectively optimize the explosive quality of athletes, so that they can take more initiative in the field, which is worth promoting in China's football training. I hope to improve the training level and competitive level of Chinese football, get better results in football matches, improve the ranking of Chinese football in the world and realize the Chinese dream in football by optimizing the training mode of football, selecting football training methods that are more suitable for Chinese players, and conducting football training scientifically.

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