

The Effects of Crossfit Training Program on Promoting Physical Fitness Towards a Training Program for Guangdong University Basketball League Players

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Abstract: In this paper, 20 basketball players from each of the three universities who participated in the Guangdong University Basketball League, total 60 persons, were used as experimental subjects. Each university was divided into an experimental group of 10 players and a control group of 10 players for a 12-week comparison experiment. The experimental group was trained using CrossFit program and the control group was trained using traditional physical training methods. The six indexes of body shape, strength, speed, endurance, flexibility and agility were taken as the physical fitness evaluation indexes, and the corresponding test items were body fat percentage, standing long jump, bench press, squat, deadlift, 3/4 full-court sprint run, 15×17 folding run, 3000 meters run, seated body flexion, and T-word agility test, a total of 10 test items. The data collected before and after the 12 weeks of training were statistically and analytically analysed through the use of EXCEL and SPSS26.0 software. To explore the effects of CrossFit training on athletes' physical fitness relative to traditional physical training. The purpose of the study is to combine CrossFit training with the characteristics of basketball, arrange and design a targeted training program, and help athletes of the Guangdong University Basketball League to improve their physical fitness and performance on the basketball court through scientific training means and methods. Conclusion: Before the CrossFit training program, there is no significant difference in the physical fitness index scores of body shape, strength, speed, endurance, flexibility and sensitivity between the control group and the experimental group, There is no significant difference between the physical status of the control group and the experimental group before the CrossFit training program; After the CrossFit training program, there are significant differences between the control group and the experimental group in terms of body shape, strength, speed, endurance. There were no significant differences in flexibility and sensitivity, but the experimental group improved more than the control group. There is a significant difference between the physical status of the control group and the experimental group after the CrossFit training program; There is no significant difference in the physical status of the control group before and after the experiment. There is a significant difference in the physical status of the experimental group before and after CrossFit training. CrossFit training program is more suitable for improving the physical fitness of college basketball players in Guangdong Province.

Keywords: CrossFit, Guangdong College Basketball League, Physical Training.

1. Introduction

CrossFit means "sustained and diverse functional exercise at high intensity." Functional exercise is a complex exercise that is just a common muscle supplementation program consisting of a series of contractions from the core to the end. However, functional actions cannot be ignored as they can quickly move heavy objects over long distances. The combined effect of these three attributes (load, distance, and speed) can generate high real-time power unique to functional operations. Greg Glassman pointed out in his "CrossFit Level 1 Training Guide" that the CrossFit training program originated in the United States and was founded by Greg Glassman in 2000[1]. The CrossFit training mode outperforms traditional fitness methods in a more natural way, especially in the United States. A more natural way of practicing, using less equipment and interspersed with various training content, greatly helps people overcome the boredom of training, thus achieving unimaginable results in practice.

After reviewing relevant literature on basketball physical fitness and basketball physical fitness in Guangdong Province, Li Guangliang and Pang Hui et al. closely combined the characteristics of basketball physical fitness training, summarized the basic concepts and principles of basketball physical fitness, proposed that the physical fitness level of

basketball players mainly consists of the composition of specific speed, overall strength, sports endurance, and psychological function, and proposed some novel and unique special physical fitness training methods [2,3]. Zhang Yongjun published an article exploring the characteristics, physical fitness, training role in basketball, and existing problems of Guangdong Province's high-level basketball team from a physiological perspective through investigation, observation, and experimental research. This provides reference for improving the level of high-level basketball in Guangdong Province's universities[4]. Shen Changgeng's study on the specific physical fitness characteristics of basketball players shows that the quality of basketball specific physical fitness directly determines the outcome of the game. This article studies the main characteristics, principles, methods, and recovery measures of basketball physical training, aiming to provide guidance for strengthening modern basketball physical training[5]. Liu Liyu pointed out that from the perspective of university basketball, it is necessary to analyze and judge the special physical characteristics of university basketball teaching, and propose more targeted, closer to teaching reality and the development of the times methods and means[6]. This is conducive to promoting the development of specialized physical training for college basketball players to a higher level. Summarizing relevant literature, researchers have studied the importance of physical

fitness in basketball from multiple perspectives, identified problems with physical fitness in college basketball, and urgently sought scientific training methods to develop physical fitness.

Through literature review, it was found that researchers only have one article on the use of Guangdong Province's basketball CrossFit fitness training, while there is still a gap in Guangdong Province's basketball CrossFit fitness training. There is little research on CrossFit physical training in Guangdong Province. By visiting schools with good physical education in Guangdong Province, as well as sports schools and clubs at all levels and cities, it was found that they rarely engage in CrossFit physical training. Summarizing the experience of CrossFit physical training in Guangdong Province, although there are still shortcomings, it is still in development. Past experience has taught us that the application of CrossFit fitness training in various sports projects is feasible and needs to be promoted and implemented. In addition, we will increase research on training programs for basketball players in various fields and age groups, such as conducting this study on basketball players from Guangdong University. Through experiments, we aim to find more scientific and powerful methods for physical fitness training to be applied in this field, enriching the scientific research on CrossFit physical fitness training in this field and hoping to provide strong theoretical guidance. at the top of this page.

2. Method

2.1. Experimental Design

This study adopts a quantitative research design to determine the impact of cross fitness training on the physical fitness improvement of basketball players in ordinary universities in Guangdong Province. In this case, quantitative research methods are preferred as they can generate objective and numerical data for statistical analysis to draw effective conclusions. The main research method used in this study is comparative experimental design. This method was chosen to determine the significant differences between the CrossFit training group and the traditional fitness training group, and to determine the advantages of CrossFit training. Using this design, this study attempts to determine the promoting effect of CrossFit training on the physical fitness training of basketball players at Guangdong University. The experimental design section below provides a detailed description.

Experimental design refers to the design of any task, whose purpose is to describe and assume the changes in information that are explained under constantly changing conditions. Firstly, in order to determine the experimental objectives, the control variables must remain unchanged to prevent external factors from affecting the results. By establishing reference standards for experimental participants (such as a. body shape, b. strength, c. speed, d. endurance, e. flexibility, f. sensitivity), ensure that the basic information of the two groups of experimenters is close to the same. During the experiment, try to control the influence of irrelevant variables as much as possible, such as ensuring similar nutrient intake and sleep recovery. By carefully selecting independent variables, the risk of measurement errors is reduced, and the documentation of the method is ensured to be sufficiently detailed to ensure the effectiveness and reliability of the experimental design.

2.2. Study Participants

To ensure the effectiveness of the experiment, it is necessary to strictly select participants before conducting the experiment. Firstly, it is necessary to ensure that the differences between the experimental group and the control group participants are minimized. Therefore, a range should be set for the body shape (height, weight) and training years of these college athletes to ensure that their basic information is consistent. Secondly, as Chinese university students have accommodation and meals in school, this can further ensure the reduction of differences in nutritional intake among athletes in their daily lives. Finally, in order to further reduce experimental interference, athletes must comply with management arrangements, stay at school throughout the entire experimental period, and are not allowed to go out or go home without authorization.

The researchers determined the selection criteria for participants and the population participating in the experiment by collecting basic information, expert opinions, and reviewing relevant literature on basketball players in Guangdong Province.

Selection criteria for participants.

a. Participation period (2-3 years) b. Height (1.75 meters to 1.95 meters)

b. Weight (75-95 kilograms) d. Training time (2-3 years)

In addition, due to only about 30 athletes being trained in the school and limited indicators, it was ultimately decided to use 20 people as experimental subjects for each university. Test subjects (population): 20 basketball players from Guangdong University of Technology, 20 basketball players from Guangdong University of Industry and Technology, and 20 basketball players from Guangdong University of Science and Technology participating in the Guangdong University Basketball League. At each experimental point, 20 subjects were randomly divided into a 10 person cross training experimental group and a 10 person traditional physical fitness training control group.

2.3. Experimental Arrangement

(1) Control group (routine training)

Training time: Tuesday, Thursday, Saturday, a total of 12 weeks.

Training duration: 90 minutes.

Training locations: Guangdong University of Technology, Guangdong University of Business and Technology, Guangdong University of Science and Technology Athletics Stadium, and Gymnasium.

Training content arrangement: Adopting periodic training, the exercise intensity increases periodically, with every three weeks as a cycle, and the growth rate is about 20% of the previous cycle.

(2) Experimental group (Crossfit training):

Training time: Tuesday, Thursday, Saturday, a total of 12 weeks.

Training duration: 90 minutes.

Training locations: Guangdong University of Technology, Guangdong University of Business and Technology, Guangdong University of Science and Technology Athletics Stadium, and Gymnasium.

Training content arrangement: divided into unit days, binary days, and ternary days. Course arrangement for the experimental group training course: Section

The first stage of training courses is arranged based on the training methods and characteristics of the CrossFit training

plan, as well as the top ten body functions it targets. The training exercises are selected from the daily WOD and CrossFit Level 1 Training Guide published on the official CrossFit website. Based on the actual situation of the subjects and existing facilities, some training movements were reasonably reduced. The number of training groups in the first stage is 3, and in the second stage, repeat the exercises from the first stage. The training load increases periodically and is mainly controlled by the training load, which is about 30% of the previous stage. The number of training groups increased to 4, and in the third stage, it increased to 5 groups.

3. Results and Analysis

3.1. Comparative Analysis of Various Physical Fitness Indicators between the Two Groups of Athletes before the Experiment

This experiment selected 60 basketball players from three universities as the experimental subjects, with 30 athletes as the experimental group and 30 athletes as the control group. Before the experiment, independent sample analysis was conducted on the test data of 10 physical fitness indicators of the subjects using SPSS 26.0 software. The specific test results are shown in Table 1.

Table 1. Comparative analysis of physical fitness indicators between two groups of athletes after the experiment

<i>Evaluation content</i>	<i>Test items</i>	<i>Groups</i>	<i>N</i>	<i>Mean±Sd</i>	<i>T</i>	<i>P</i>
<i>Body shape</i>	<i>Body fat percentage(%)</i>	<i>Experimental Group</i>	30	12.77±2.92	-2.957	0.004
		<i>Control Group</i>	30	14.93±2.75		
<i>Strength</i>	<i>Standing long jump(cm)</i>	<i>Experimental Group</i>	30	269.53±5.64	2.087	0.042
		<i>Control Group</i>	30	265.27±9.67		
	<i>Bench press(kg)</i>	<i>Experimental Group</i>	30	80.75±6.06	2.228	0.030
		<i>Control Group</i>	30	77.58±4.89		
<i>Squat(kg)</i>	<i>Experimental Group</i>	30	113.67±14.74	2.142	0.036	
	<i>Control Group</i>	30	106.42±11.25			
<i>Deadlift(kg)</i>	<i>Experimental Group</i>	30	138.83±17.64	2.073	0.043	
	<i>Control Group</i>	30	130.42±13.54			
<i>Speed</i>	<i>3/4 sprint run(s)</i>	<i>Experimental Group</i>	30	3.50±0.18	-3.046	0.003
		<i>Control Group</i>	30	3.64±0.18		
<i>Endurance</i>	<i>3000 meters(min)</i>	<i>Experimental Group</i>	30	13.76±1.40	-2.117	0.039
		<i>Control Group</i>	30	14.50±1.31		
	<i>17×15 meter turn back run(s)</i>	<i>Experimental Group</i>	30	62.23±2.78	-2.379	0.021
<i>Control Group</i>	30	63.97±2.90				
<i>Flexibility</i>	<i>Sitting forward Flexion(cm)</i>	<i>Experimental Group</i>	30	13.54±3.61	1.862	0.068
		<i>Control Group</i>	30	11.78±3.71		
<i>Sensitive</i>	<i>T-sensitivity test(s)</i>	<i>Experimental Group</i>	30	12.11±1.55	-1.066	0.291
		<i>Control Group</i>	30	12.55±1.69		

Note: N=Number of people, Mean±Sd=Mean value±Std. Deviation, T=T value, P=P value.

The pre experiment test results showed that the average body fat percentage of the experimental group was 15.96%, while the average value of the control group was 16.37%, with a P-value of 0.675 (P>0.05), indicating that there was no significant difference in the body fat ratio between the two groups of participants before the experiment; The average score of the experimental group in standing long jump was 260.47cm, while the control group was 261.93cm, with a P-value of 0.527 (P>0.05), indicating that there was no significant difference in body fat percentage between the two groups of athletes before the experiment; The average score of the experimental group's bench press was 75.83kg, while the average score of the control group was 75.17kg, with a P-value of 0.636 (P>0.05), indicating that there was no significant difference in the bench press scores between the two groups of athletes before the experiment; The average score of the squat test group was 101.50kg, while the average score of the control group was 102.25kg, with a P-value of 0.816 (P>0.05). There was no significant difference in squat performance between the two groups before the experiment; The average lifting score of the experimental group was 126.25kg, while the average lifting score of the control group was 124.83kg, with a P-value of 0.712 (P>0.05). There was no significant difference in lifting scores between the two groups before the experiment. The average score of the 3/4

sprint experimental group was 3.66 seconds, while the average score of the control group was 3.73 seconds, with a P value of 0.113 (P>0.05). There was no significant difference in the 3/4 sprint scores between the two groups before the experiment; The average score of the 300 meter experimental group was 14.72 minutes, while the average score of the control group was 15.14 minutes, with a P value of 0.261 (P>0.05). There was no significant difference in the 3000 meter scores between the two groups before the experiment; The average score of the 17 × 15 meter turn back run experimental group was 64.39 seconds, while the average score of the control group was 65.04 seconds, with a P value of 0.402 (P>0.05). The results of the 17 × 15 meter turn back run in the first two groups before the experiment were also significant. There was no significant difference in the results of the meter turn back run before the experiment; The average score of the sitting forward flexion experimental group was 12.83cm, while the average score of the control group was 11.41cm, with a P value of 0.163 (P>0.05). Before the experiment, the average score of the sitting forward flexion T-sensitivity test for the two groups of athletes was 12.83s, while the average score of the control group was 13.02s, with a P value of 0.679 (P>0.05).

The above test results indicate that the physical fitness of the two groups of athletes was at the same level before the

test, and there was no significant difference. Therefore, experimental research can be conducted based on this group.

3.2. Comparative Analysis of Various Physical Fitness Indicators between Two Groups of Athletes after the Experiment

Table 2. Comparative analysis of physical fitness indicators between two groups of athletes after the experiment

Evaluation content	Test items	Groups	N	Mean±Sd	T	P
Body shape	Body fat percentage(%)	Experimental Group	30	12.77±2.92	-2.957	0.004
		Control Group	30	14.93±2.75		
Strength	Standing long jump(cm)	Experimental Group	30	269.53±5.64	2.087	0.042
		Control Group	30	265.27±9.67		
	Bench press(kg)	Experimental Group	30	80.75±6.06	2.228	0.030
		Control Group	30	77.58±4.89		
Squat(kg)	Experimental Group	30	113.67±14.74	2.142	0.036	
	Control Group	30	106.42±11.25			
Deadlift(kg)	Experimental Group	30	138.83±17.64	2.073	0.043	
	Control Group	30	130.42±13.54			
Speed	3/4 sprint run(s)	Experimental Group	30	3.50±0.18	-3.046	0.003
		Control Group	30	3.64±0.18		
Endurance	3000 meters(min)	Experimental Group	30	13.76±1.40	-2.117	0.039
		Control Group	30	14.50±1.31		
17×15 meter turn back run(s)	Experimental Group	30	62.23±2.78	-2.379	0.021	
	Control Group	30	63.97±2.90			
Flexibility	Sitting forward Flexion(cm)	Experimental Group	30	13.54±3.61	1.862	0.068
		Control Group	30	11.78±3.71		
Sensitive	T-sensitivity test(s)	Experimental Group	30	12.11±1.55	-1.066	0.291
		Control Group	30	12.55±1.69		

Note:N=Number of people, Mean±Sd=Mean value±Std. Deviation,T=T value, P=P value.

The post experiment test results showed that the average body fat percentage of the experimental group was 12.77%, while the average value of the control group was 14.93%, with a P-value of 0.004 ($P < 0.01$), indicating a significant difference in the body fat ratio between the two groups of participants after the experiment; The average score of the experimental group in standing long jump was 269.53cm, while the control group was 265.27cm, with a P-value of 0.042 ($P < 0.05$), indicating a significant difference in the standing long jump performance between the two groups of athletes after the experiment; The average score of the experimental group's bench press was 80.75kg, while the average score of the control group was 77.58kg, with a P-value of 0.030 ($P < 0.05$), indicating a significant difference in bench press scores between the two groups of athletes after the experiment; The average score of the squat test group was 113.67kg, while the average score of the control group was 106.42kg, with a P-value of 0.036 ($P < 0.05$). There was a significant difference in squat performance between the two groups after the experiment; The average hard pull score of the experimental group was 138.83kg, while the average score of the control group was 130.42kg, with a P-value of 0.043 ($P < 0.05$). There was a significant difference in hard pull scores between the two groups after the experiment. The average score of the 3/4 sprint experimental group was 3.50s, while the average score of the control group was 3.64s, with a P-value of 0.003 ($P < 0.05$). After the experiment, there was a significant difference in the 3/4 sprint scores between the two groups; The average score of the 3000 meter experimental group was 13.76 minutes, while the average score of the control group was 14.50 minutes, with a P-value of 0.039 ($P < 0.05$). There was a significant difference in the 3000 meter scores between the two groups after the experiment; The average score of the 17 × 15 meter turn back

run experimental group was 62.23 seconds, while the average score of the control group was 63.97 seconds, with a P value of 0.021 ($P < 0.05$). After the experiment, the results of the two groups of 17 × 15 meter turn back runs were satisfactory. There is a significant difference in the results of the meter turn back run after the experiment; The average score of the sitting and backward flexion experimental group was 13.54cm, while the average score of the control group was 11.78cm, with a P value of 0.068 ($P > 0.05$). After the experiment, the average score of the sitting and forward flexion T-sensitivity test for the two groups of athletes was 12.11s, while the average score of the control group's T-sensitivity test was 12.55s, with a P value of 0.291 ($P > 0.05$).

The above test results indicate that there is a significant difference in physical fitness between the two groups of athletes after the test, indicating that the training effect of the experimental group is better than that of the control group.

4. Conclusion

By comparing and analyzing the data before and after 12 weeks of CrossFit training and traditional physical fitness training for basketball players in Guangdong Province's universities, the following conclusions can be drawn:

(1) Before the CrossFit training program, there was no significant difference in physical fitness scores between the control group and the experimental group in terms of body shape, strength, speed, endurance, flexibility, and sensitivity ($P > 0.05$). Before the CrossFit training program, there was no significant difference in physical condition between the control group and the experimental group. This indicates that the physical fitness of the two groups of players was similar before the experiment, which is consistent with the progress of the experiment.

(2) After CrossFit training, there were significant

differences ($P < 0.05$) between the control group and the experimental group in terms of body shape, strength, speed, endurance, etc. In terms of flexibility and sensitivity, the experimental group made more progress than the control group. After CrossFit training, there was a significant difference in physical condition between the control group and the experimental group. This means that the experimental group trained much better than the control group after the experiment. After a 12 week experiment, cross training for basketball players in ordinary universities in Guangdong Province has achieved significant improvement in physical fitness, far superior to traditional physical training interventions.

(3) There was no significant difference in physical condition between the control group before and after the experiment ($P > 0.05$). There was a significant difference in the physical condition of the experimental group before and after CrossFit training ($P < 0.05$). This indicates that CrossFit training has a significant effect, while traditional physical training has no significant effect. The CrossFit training program is more suitable for the physical fitness training of basketball players in Guangdong Province's universities.

5. Recommendations

(1) CrossFit training programs achieve better results than traditional physical training within the same amount of time. It is recommended that basketball players from universities in Guangdong Province improve their physical fitness through the CrossFit training program and understand the scientific and effective methods for improving basketball physical fitness. Master and apply CrossFit training methods in future basketball physical fitness training.

(2) It is suggested that coaches can adjust and modify previous basketball physical training methods, apply scientific and efficient cross training plans to college basketball player physical training courses, help teams break

through physical training bottlenecks, and thus obtain huge profits. It is recommended that school administrators pay more attention to basketball sports competitions, support the CrossFit training program in college basketball physical training, and ensure material and human resources protection.

(3) Suggest other researchers to apply the CrossFit training program to student basketball players of different age groups in other provinces of China. However, as the experimental results of this study indicate that the impact of the Crossfit training program on the physical fitness of basketball players in Guangdong Province still needs further improvement, the Crossfit training program still needs to be further improved.

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