EFFECTS OF CROSSFIT PRACTICE ON THE PERFORMANCE OF BASKETBALL ATHLETES

EFEITOS DA PRÁTICA DE CROSSFIT SOBRE O DESEMPENHO DE ATLETAS DE BASQUETEBOL

EFECTOS DE LA PRÁCTICA DE CROSSFIT EN EL RENDIMIENTO DE DEPORTISTAS DE BALONCESTO

Original Article
Artigo Original
Artículo Original

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ABSTRACT

Introduction: The strength training and conditioning program known as CrossFit has demonstrated a great capacity for optimization in cardiorespiratory and muscular endurance, strength, flexibility, power, speed, coordination, agility, balance, and precision. It is believed that basketball athletes may derive benefits from their practice. Objective: Explore the effects of CrossFit practice on the sport performance of basketball athletes. Methods: Sixteen athletes were randomly divided into experimental and control groups. The experimental group performed adapted CrossFit-based training, while the control group remained with traditional training. The indices relevant to the study were captured before and after the intervention, statistically analyzed, and discussed considering the current literature. Results: The average body fat rate of the experimental group was reduced from 22.33% to 17.68%, the average vital capacity increased from 6210.08 ml to 6270.44 ml; the average time of the 3000 m run was accelerated from 14.00 min to 12.50 min, and the average horizontal pull force value was increased from 63.02 kg to 79.84 kg; and the average ball hit rate in one minute increased from 31.06% to 40.17%. Conclusion: The application of CrossFit-based training was shown to effectively improve the physical level, fitness, and sports performance of basketball players, and can be applied to everyday training. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Basketball; Physical Education and Training; Athletic Performance; Training, Endurance.

RESUMO

Introdução: O programa de treinamento de força e condicionamento conhecido como CrossFit tem demonstrado grande capacidade de otimização na resistência cardiorrespiratória e muscular, força, flexibilidade, potência, velocidade, coordenação, agilidade, equilíbrio e precisão. Acredita-se que os atletas de basquetebol possam obter benefícios com a sua prática. Objetivo: Explorar os efeitos da prática de CrossFit sobre o desempenho esportivo de atletas de basquetebol. Métodos: Dezesseis atletas foram divididos aleatoriamente em grupo experimental e grupo de controle. O grupo experimental executou um treinamento adaptado baseado em CrossFit, enquanto o grupo controle permaneceu com o treinamento tradicional. Os índices relevantes ao estudo foram captados antes e após a intervenção, analisados estatisticamente e discutidos considerando a literatura atual. Resultados: A taxa média de gordura corporal do grupo experimental foi reduzida de 22,33% para 17,68%, a capacidade média vital aumentou de 6210,08 ml para 6270,44 ml; o tempo médio da corrida de 3000 m foi acelerado de 14,00 min para 12,50 min, e o valor médio da força de tração horizontal foi aumentado de 63,02 kg para 79,84 kg; e a taxa média de acertos de bola em um minuto aumentou de 31,06% para 40,17%. Conclusão: A aplicação do treinamento baseado em CrossFit demonstrou melhorar efetivamente o nível físico, a aptidão física e o desempenho esportivo nos jogadores de basquetebol, podendo ser aplicado ao treinamento cotidiano. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Basquetebol; Educação Física e Treinamento; Desempenho Atlético; Treino de Resistência Física.*

RESUMEN

Introducción: El programa de entrenamiento de fuerza y acondicionamiento conocido como CrossFit ha demostrado gran capacidad de optimización en resistencia cardiorrespiratoria y muscular, fuerza, flexibilidad, potencia, velocidad, coordinación, agilidad, equilibrio y precisión. Se cree que los atletas de baloncesto pueden obtener beneficios de su práctica. Objetivo: Explorar los efectos de la práctica de CrossFit en el rendimiento deportivo de atletas de baloncesto. Métodos: Dieciséis atletas fueron divididos aleatoriamente en grupo experimental y grupo control. El grupo experimental realizó un entrenamiento adaptado basado en CrossFit, mientras que el grupo control se mantuvo con el entrenamiento tradicional. Los índices relevantes para el estudio fueron capturados antes y después de la intervención, analizados estadísticamente y discutidos teniendo en cuenta la literatura actual. Resultados: El índice medio de grasa corporal del grupo experimental se redujo del 22,33% al 17,68%, la capacidad vital media aumentó de 6210,08 ml a 6270,44 ml; el tiempo medio de la carrera de 3000 m se aceleró de 14,00 min a 12,50 min, y el valor medio de la fuerza de tracción horizontal aumentó de 63,02 kg a 79,84 kg; y el índice medio de golpeos de balón en un minuto aumentó del 31,06% al 40,17%. Conclusión: La aplicación

del entrenamiento basado en CrossFit demostró mejorar eficazmente el nivel físico, la forma física y el rendimiento deportivo en jugadores de baloncesto, y puede aplicarse al entrenamiento diario. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Baloncesto; Educación y Entrenamiento Físico; Rendimiento Atlético; Entrenamiento de Resistencia.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012023_0033 Article received on 01/31/2023 accepted on 02/10/2023

INTRODUCTION

Basketball is one of the most popular sports in international competitions, and shooting technology is the most important skill in basketball.[1] It is very important to improve the shooting technique and shooting hit rate for cultivating good basketball reserve talents, improving training methods and improving training enthusiasm. Cross fit is a training system combining strength and adaptability exercises.[2] The whole training program was originally designed to promote as many adaptive responses as possible. Different from traditional training, cross fit is not a single discipline training plan, but is committed to optimizing ten physical qualities, such as human strength, flexibility, explosive power and speed, which are widely recognized in a strong state.[3] Cross fit training integrates every movement to maximize the muscle efficiency of athletes. At the same time, cross fit training is not limited by other factors such as equipment and space.[4] This paper studies the influence of cross fit training items on shooting techniques and shooting percentage by using the methods of literature, mathematical statistics and experiments. According to the actual needs of basketball and the previous training programs of basketball, the relevant experiments were designed with cross fit training as a variable.[5] Explore the application of cross fit training mode in basketball training, especially the effect of improving the performance of basketball players, so as to provide some suggestions for better improving the performance level of basketball players.[6]

METHOD

Research object

According to the purpose of the study, after initially mastering the relevant content of the cross fit training mode and its application in basketball, this study selected a total of 20 college basketball players from a university sports college in a city through a questionnaire survey. The study and all the participants were reviewed and approved by Ethics Committee of Suqian University (NO.SUQUST068D). After preliminary screening and confirmation, 16 subjects were finally determined. The selected athletes have no significant differences in age, height, weight and training duration, which meet the requirements of the experiment. In addition, all the tested college athletes are in good health and exercise ability, have a certain understanding of the experiment and have signed a letter of understanding to ensure that the experiment can be carried out smoothly.

Experimental method

Before the experiment, this paper first determined the relevant indicators of the physical fitness level of basketball players and the basketball shooting percentage test according to the relevant literature and expert interviews. Through the communication with coaches and athletes, the preliminary control experiment method and the content of intervention training were determined. According to the test indicators selected in this paper, the initial test data of the experimental group and the control group were counted before the experiment.

Sixteen college students were randomly divided into experimental group and control group. In the course of the experiment, the experimental group carried out the cross fit training mode, combined with the actual situation of the athletes tested by the coaches, designed the training scheme, and carried out multi-pattern aerobic and anaerobic interpenetration training. The main training methods include sit-ups, rope skipping and bobby jumping. During the period, the students in the control group received regular basketball special training. In addition, the basic physical training and daily living habits are basically the same, so as to minimize the interference of external factors and ensure the effectiveness of the experiment.

Test indicators

The application effect of cross fit training mode in basketball training mainly measures three indicators of physical fitness level (body fat rate, vital capacity and heart rate) and six indicators of physical fitness level (3000m, standing long jump, hard pull strength, push strength, 30s squat+push number and T-sensitivity test).

The application effect of cross fit training mode on basketball performance and shooting hit rate is mainly to measure the three indicators of 17 * 15m turn-back run, 3/4 full-court sprint and one-minute jump of the tested athletes.

In order to ensure the accuracy of the experimental results during the measurement process, the next item should be tested after an interval of 5 minutes before each test. The records before and after the test are made by the same person. Before testing the physical fitness level, the tested athletes need to ensure adequate rest the night before, and do not do strenuous exercise and have large emotional fluctuations after 30 minutes before the test, so as not to affect the test results.

Selection of experimental equipment

The experimental equipment used in this experiment mainly includes the stopwatch, yellow marking tape, marking flags, fixed hard pulling instruments, simple horizontal pusher and yoga mat used in the test; Barbell, increased shooting training basketball (No. 9), finger corrector, rebound resistance device and shooting posture correction box required for training. Among them, the basketball for increased shooting training is PU rubber with a circumference of 950mm. The finger corrector is used to correct the hand movement and stabilize the hand shape when shooting. The bounce resistance device is used for the belt and ankle, and is fixed by the binding, in order to further increase the athletes' bounce ability, increase the core strength and improve the shooting stability.

RESULTS

Application effect of cross fit training mode in basketball training

First of all, the application effect of the cross fit training mode in the experimental group in the physical fitness level of basketball special college students was analyzed, and the results of the changes in the physical fitness level of the tested college students before and after the training were compared, as shown in Table 1.

From the data in Table 1, it can be seen that after six weeks of cross-fit training mode, the three indicators of body fat rate, vital capacity and heart rate of the basketball special college students all showed a certain degree of change. The body fat rate changed significantly (P. The changes of vital capacity and heart rate were significant (P<0.05). The mean value of vital capacity increased from 6210.08ml to 6270.44ml,

Table 1. The application effect of cross fit training mode in basketball college students' physique level.

Option	Before experiment		After experiment		Rate of change	P value
	X	SD	X	SD		
Body fat rate (%)	22.33	4.556	17.68	3.709	-26.269%	<0.01
Vital capacity (ml)	6,210.08	1,042.237	6,270.44	1,083.878	0.963%	<0.05
Heart rate (times/minute)	57.20	7.493	54.68	5.493	-4.604%	<0.05

and the heart rate changed from 57.20 beats/min to 54.68 beats/min. The three indicators of college students' physical fitness level have been improved to a certain extent, which proves the effectiveness of cross fit training mode for improving the overall quality and physical fitness level of athletes.

After that, statistical analysis was carried out on the students in the control group who received routine training. The results of physical fitness level are shown in Table 2.

It can be seen from the data in Table 2 that after six weeks of routine training, the changes in the three indicators of body fat rate, vital capacity and heart rate of the students in the control group were not obvious, only the vital capacity showed significant changes (P. The changes of body fat rate and heart rate were not statistically significant. It shows that conventional training has limited effect on improving the physical fitness of basketball majors, and the cross fit training mode is more effective.

Test the physical test results of the college students, and the results of the experimental group are shown in Table 3.

The data in Table 3 shows that the physical test level of the experimental group trained in the six-week cross-fit training mode has been significantly improved, and the changes in the three indicators of 3000m, standing long jump and horizontal push strength are very significant (P<0.01). The average value of 3000m increased from 14.00min to 12.50min; The average value of standing long jump increased from 246.44cm to 256.40cm; The average strength of horizontal push increased from 63.02kg to 79.84kg. In addition, the average hard pull force increased from 101.58kg to 114.13kg; The average number of 30s squat+horizontal push increased from 32.32 to 35.77; The average T-sensitivity test score increased from 12.06 to 11.61.

The statistical analysis of the physical test level of the control group of college students undergoing routine training is shown in Table 4.

From the data in Table 4, it can be seen that the students in the control group had no significant changes in hard pull strength, the number of 30s squat+bench press and T-sensitivity test, except for the changes in the three indicators of 3000m, standing long jump and bench press strength before and after the test (P>0.05). The change rate of 3000m is greater than that of the experimental group, which is -15.915%, while that of the experimental group is -12.011%.

Application effect of cross fit training mode on basketball results and shooting percentage

Finally, the basketball performance and shooting percentage of the tested players were tested. The results of the experimental group are shown in Table 5.

It can be seen from the data in Table 5 that after six weeks of training, the students in the experimental group have significantly improved in the three indicators of 17 * 15m turn-back run, 3/4 full-court sprint and one-minute jump. Among them, the average value of the results before and after the 17 * 15m turn back run changed significantly (P<0.01), from 64.88s to 62.69s. The average sprint performance of 3/4 was reduced from 3.89s to 3.53s. The average one-minute jump shot rate increased from 31.06% to 40.17%.

The statistical analysis of basketball level of college students in the control group undergoing routine training is shown in Table 6.

It can be seen from Table 6 that compared with the experimental group, the students in the control group have less changes in the three indicators, of which the results of the 17 * 15m turn-back run and the 3/4 full-court sprint have significant changes before and after (P<0.05), and the results of the one-minute jump basket index have no significant changes (P>0.05). The average score before and after the 17 * 15m turn back run increased from 64.51s to 65.35s, showing a decline. The average sprint performance of 3/4 was shortened from 3.80s to 3.71s.

Table 2. The Application Effect of Conventional Training Mode in Basketball College Students' Physical Fitness.

Option	Before experiment		After experiment		Rate of change	P value
	X	SD	X	SD		
Body fat rate (%)	20.74	7.180	20.04	6.606	-3.526%	<0.05
Vital capacity (ml)	5,625.33	1,030.328	5,685.39	1,043.785	1.056%	<0.05
Heart rate (times/minute)	58.78	8.137	58.36	7.170	-0.725%	>0.05

Table 3. The application effect of cross fit training mode in the physical test level of basketball special college students.

Option	Before experiment		After experiment		Rate of change	P value
	X	SD	X	SD		
3000m (min)	14.00	1.982	12.50	1.016	-12.011%	<0.01
Standing long jump (cm)	246.44	8.228	256.40	11.848	3.884%	<0.01
Hard pulling force (kg)	101.58	21.253	114.13	18.887	10.996%	<0.05
Horizontal push force (kg)	63.02	9.310	79.84	10.193	21.063%	<0.01
30s squat+number of horizontal push	32.32	3.970	35.77	3.752	9.659%	<0.05
T sensitivity test	12.06	1.687	11.61	1.085	-3.875%	<0.05

Table 4. The Application Effect of Conventional Training Mode in the Physical Test Level of Basketball College Students.

Option	Before experiment		After experiment		Rate of change	P value
	X	SD	X	SD		
3000m (min)	14.85	2.752	12.81	1.159	-15.915%	<0.01
Standing long jump (cm)	246.54	9.498	250.10	9.548	1.422%	<0.05
Hard pulling force (kg)	101.58	21.253	111.65	19.488	9.018%	>0.05
Horizontal push force (kg)	63.02	10.918	71.56	10.711	11.929%	<0.05
30s squat+number of horizontal push	31.10	3.761	31.50	3.588	1.290%	>0.05
T sensitivity test	11.98	1.298	11.86	1.105	-1.037%	>0.05

Table 5. The application effect of cross fit training mode in basketball level of college students.

Option	Before experiment		After experiment		Rate of change	P value
	X	SD	X	SD		
17 * 15m turn-back run	64.88	3.472	62.69	2.012	-3.482%	<0.01
3/4 full court sprints	3.89	0.189	3.53	0.102	-10.375%	<0.05
One minute jump%	31.06	10.590	40.17	4.083	22.677%	<0.05

Table 6. The Application Effect of Conventional Training Mode in the Basketball Level of College Students.

Option	Before experiment		After experiment		Rate of change	P value
	X	SD	X	SD		
17 * 15m turn-back run	64.51	4.409	65.35	2.520	1.288%	<0.05
3/4 full court sprints	3.80	0.298	3.71	0.256	-2.466%	<0.05
One minute jump%	31.89	17.440	34.25	14.636	6.904%	>0.05

DISCUSSION

Cross fit is a training system that combines basic strength training and adaptive training. The whole training plan is to achieve the best adaptability. First of all, the focus of cross fit training is not isolated muscle exercises, but continuous functional movements under high intensity. The advantage of using complex actions to improve the physical fitness of athletes is that each action uses multiple muscles, which comprehensively improves the athletic ability of all muscles. Therefore, athletes do not need to do the upper and lower body strength training separately, but can perform better in tests reflecting different physical fitness.

Cross fit training is a relatively new training method, which has been incorporated into the daily training of some athletes at this stage and has achieved good results, but it does not challenge the effectiveness of traditional training methods. In traditional training methods, athletes' desire to win with the help of more people will lead them to work harder to complete the training. The emphasis on running and jumping in traditional physical training is still worthy of recognition. Therefore, in actual training, we should combine the two training methods to play a better role in the overall performance of basketball players.

CONCLUSION

Cross fit training organically combines high-intensity training with functional training, which can effectively improve the overall quality of athletes and adapt to the requirements of basketball for basketball, which is a strong antagonistic and fast-paced sport. According to the characteristics of cross fit training, combined with the actual situation of basketball, this paper discusses the application of cross fit training mode and its impact on basketball hit rate through comparative experiments. The experimental results show that the improvement effect of cross fit training is more significant and comprehensive. Therefore, the experimental group trained with cross fit method is better than the control group trained with traditional method in training pertinence. The cross fit training mode can improve the basic physical quality and special level of basketball players to a certain extent. At the same time, taking into account the physical and psychological development of young athletes, in order to make the best use of the advantages of different training methods to achieve the goal of improving athletes' basketball specific physical fitness, basketball coaches should combine cross fit training with traditional physical fitness training, and formulate basketball training plans according to the actual situation of athletes, in order to achieve the best training effect.

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

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. Xiang Li: writing and execution.

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