REACTIONS ON PHYSICAL FITNESS TRIGGERED BY CORE STRENGTH TRAINING IN MALE COLLEGE BASKETBALL PLAYERS

ORIGINAL ARTICLE
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REAÇÕES SOBRE A APTIDÃO FÍSICA DESENCADEADAS PELO TREINO DE FORÇA DO CORE EM JOGADORES DE BASQUETE MASCULINO UNIVERSITÁRIO

REACCIONES SOBRE LA APTITUD FÍSICA DESENCADENADAS POR EL ENTRENAMIENTO DEL CORE EN JUGADORES DE BALONCESTO MASCULINO UNIVERSITARIO

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ABSTRACT

Introduction: Good physical fitness refers to the ability of the human body to perform daily study and work activities effectively without fatigue. The physical quality of men's basketball players is one of the essential factors affecting the team's performance. Core strength training refers to the work of the stabilization-related muscle groups located at the meeting of the base of the trunk, spine, pelvis, and lower limbs of the human body. It is believed that core strength training can help improve the basketball player's athletic physical conditioning. Objective: This study aims to explore the reactions that core strength training can provoke on physical fitness in male college basketball players. Methods: Delphi method, principal component and factor analysis, R-type cluster analysis, and professional logic analysis were used to study the physical fitness quality of male college basketball players. Results: The test indicators and methods selected in this paper can reflect the fitness level of athletes. There was no significant difference in speed, flexibility and lower body strength of athletes in different defense position, forward position and center position (P>0.05). The fitness level of athletes after core strength training was significantly improved (P<0.05). Conclusion: Core strength training can improve fundamental skills of basketball players, such as fast dribbling and short-duration running at high intensity. College male basketball players were shown to improve their indicators of physical fitness and overall physical conditioning. The results of this research provide a verified protocol that justifies its inclusion in the training of college male basketball players. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Basketball; Physical Fitness; Sports; Endurance Training.

RESUMO

Introdução: O bom condicionamento físico refere-se à capacidade do corpo humano de efetuar as atividades de estudo e laborais diárias com eficácia sem cansaço. A qualidade física dos jogadores de basquete masculino é um dos fatores essenciais que afetam o desempenho da equipe. O treino de força do core refere-se ao trabalho dos grupos musculares relacionados a estabilização localizados no encontro da base do tronco, coluna vertebral, pélvis e membros inferiores do corpo humano. Acredita-se que o treinamento de força do core possa ajudar a melhorar o condicionamento físico atlético do jogador de basquete. Objetivo: Este estudo tem como objetivo explorar as reações que o treino de força do core pode provocar sobre a aptidão física em jogadores de basquete universitário masculino. Métodos: Utilizou-se o método Delfos, análise de componentes e fatores principais, análise de cluster do tipo R e análise lógica profissional para estudar a qualidade física dos jogadores de basquete masculino universitário. Resultados: Os indicadores de teste e os métodos selecionados neste artigo podem refletir o nível de aptidão física dos atletas. Não houve diferença significativa na velocidade, flexibilidade e menor força corporal dos atletas em diferentes posições de defesa, posição de atacante e posição central (P>0,05). O nível de condicionamento físico dos atletas após o treinamento de força do core foi significativamente melhorado (P<0,05). Conclusão: O treino de força do core pode melhorar as habilidades fundamentais dos jogadores de basquete, como dribles rápidos e corrida de curta duração em alta intensidade. Demonstrou-se que os jogadores de basquete masculino universitários melhoraram seus indicadores de aptidão física e condicionamento físico geral. Os resultados desta pesquisa fornecem um protocolo verificado que justifica a sua inclusão nos treinos dos jogadores de basquete masculino universitário. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Basquetebol; Aptidão Física; Esportes; Treinamento de resistência.*

RESUMEN

Introducción: Una buena forma física se refiere a la capacidad del cuerpo humano para realizar las actividades diarias de estudio y trabajo de forma eficaz y sin fatiga. La calidad física de los jugadores de baloncesto masculinos es uno de los factores esenciales que afectan al rendimiento del equipo. El entrenamiento de la fuerza del core se refiere al trabajo de los grupos musculares relacionados con la estabilización, situados en el encuentro de la base del

tronco, la columna vertebral, la pelvis y las extremidades inferiores del cuerpo humano. Se cree que el entrenamiento de la fuerza del core puede ayudar a mejorar la condición física atlética de los jugadores de baloncesto. Objetivo: Este estudio tiene como objetivo explorar las reacciones que el entrenamiento de la fuerza del core puede provocar en la aptitud física de los jugadores de baloncesto universitarios. Métodos: Para estudiar la calidad de la aptitud física de los jugadores universitarios de baloncesto se utilizó el método Delphi, el análisis de componentes principales y de factores, el análisis de conglomerados de tipo R y el análisis lógico profesional. Resultados: Los indicadores y métodos de prueba seleccionados en este documento pueden reflejar el nivel de aptitud física de los deportistas. No hubo diferencias significativas en la velocidad, la flexibilidad y la fuerza de la parte inferior del cuerpo de los atletas en diferentes posiciones de defensa, posición delantera y posición central (P>0,05). El nivel de aptitud física de los atletas tras el entrenamiento de la fuerza central mejoró significativamente (P<0,05). Conclusión: El entrenamiento de la fuerza del core puede mejorar las habilidades fundamentales de los jugadores de baloncesto, como el regate rápido y la carrera de corta duración a alta intensidad. Se demostró que los jugadores universitarios de baloncesto masculinos mejoraron sus indicadores de aptitud y su condición física general. Los resultados de esta investigación proporcionan un protocolo verificado que justifica su inclusión en el entrenamiento de los jugadores de baloncesto masculino universitario. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Baloncesto; Aptitud Física; Deportes; Entrenamiento Aeróbico.*

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INTRODUCTION

Physical fitness refers to the ability of the human body to have sufficient energy to engage in daily work (study) without feeling fatigued, to have spare power to enjoy recreational and leisure activities, and be able to adapt to emergencies. According to the American Academy of Sports Medicine, physical fitness includes health fitness and skill fitness.[1] The main contents of healthy fitness are as follows: body composition, muscle strength, muscular endurance, cardiorespiratory endurance, and flexibility. Physical fitness includes agility, balance, coordination, speed, explosiveness, and reaction time. These elements are the basis for engaging in various sports, but there is no evidence that they are directly related to health and disease.

From the perspective of modern kinematics, physical fitness reflects a person's ability to adapt to society, sports, and the environment. That is to say, the adaptive change of people's physical quality and functional state in such a process. In the process of basketball, the technical level, tactical level, physical condition, and applicable state of the participants are constantly improving in the continuous practice and training to adapt to the ever-increasing competitive level and intensity of the game.[2] But what are the main aspects and positive effects of basketball on promoting and improving participants' physical fitness? This paper aims to find out how basketball can change the physical fitness of college students by comparing the athletes of college basketball teams with general college students to develop college basketball better.

METHOD

Research objects

This paper selects the third-year first-year students as the research object. The number of people is 80. We randomly selected 40 people to participate in the particular basketball class (exercise group), and 40 did not participate in any elective course (control group). After statistical comparison, it was found that there was no significant difference in the comparison of physical fitness indicators between the two groups of subjects.

Research methods

Documentation method

We consulted Chongqing VIP, Baidu, CNKI, highwire, basketball-related textbooks and materials, physical fitness research materials, etc.

Logic Analysis

This paper systematically analyzes the physical fitness characteristics of college basketball players.[3] At the same time, we summarize the characteristics and laws of material fitness changes of athletes in basketball training.

Visit Survey Method

We interviewed some senior college basketball teachers, coaches, scientific researchers, basketball theory experts, and physique research experts.

Mathematical Statistics

This paper uses SPSS13.0 software to carry out statistical analysis on the data measured by the experiment.

Test method

This test evaluation includes the test subjects' health and functional fitness indicators before the experiment.

Basketball virtual simulation

The basketball motion model uses the $X'YZ$ coordinate system. The X' axis represents the horizontal direction from the throw point to the basket. The Y axis represents the movement height of the basketball.[4] Suppose the deflection angle between the X' axis and the direction of the actual shot is α, and the coordinate of the ball is (X', Z) at this time. g stands for the acceleration of gravity. Θ_0 is the angle from which the basketball is thrown. v is the speed of the basketball. v_0 is the initial velocity. The dynamic equation of the basketball flying at the time t is

$$\begin{cases} \dfrac{du}{dt} = F_x \\ \dfrac{d\omega}{dt} = F_y - g \end{cases} \quad (1)$$

The air resistance on a basketball is proportional to the square of its momentum.

$$F = k\upsilon^2 \quad (2)$$

K is the air drag coefficient of the basketball in flight.

RESULTS

Design and implementation of the physical fitness training program

The experimental group participated in one semester of basketball training. The number is 40 class hours, and each class hour has two classes for a total of 90 minutes of exercise. The main experimental

contents are primary basketball theory teaching and basketball basic technical training.[5] The range includes basketball dribbling, passing, shooting, and technical and tactical training. During the experiment, the coach should supervise and control the diet and living habits of the experimental group and the control group on time. This prevents diet and living conditions from affecting the physical fitness of the research subjects. This experiment requires each subject to fill out a physical activity questionnaire and a dietary survey every month.

Characteristics of various indicators of health and fitness

Elements of body composition indicators

After half a year of systematic training, the research subjects showed no significant changes in body shape.[6] However, there were specific changes in the indicators of body composition. (Table 1) The primary performance is that the muscle strength of the exercise group increases in muscle content and decreases in fat content. There were significant differences in body fat ratio and lean body mass from the experimental results.

Characteristics of Cardiopulmonary Function, Muscle Strength and Flexibility Indicators

After basketball training, the students' flexibility in the exercise group was exercised.[7] They also improved cardiorespiratory fitness and increased arm strength. There were significant differences between the exercise and control groups. (Table 2)

Characteristics of each index of physical fitness

There was a significant difference in agility between the exercise and control groups.[8] Balance was also improved in the exercise group. Its reaction speed is also accelerated, and the explosive power of the legs is also increased accordingly. And there were significant differences in each group. (Table 3)

DISCUSSION

After half a year of systematic training, excluding the influence of other interfering factors, the college students in the exercise group have improved and improved in all aspects of physical fitness.[9] But there was no significant change in BMI. This shows that basketball exercise during a short basketball session can change the participants' body composition. But it has a more negligible effect on the body's basic shape. Perhaps other interventions and interventions or control in diet, nutrition, and living habits may have a particular impact on the effect of the experiment. Basketball can play a role in losing weight and shaping the participants. At the same time, from kinesiology and physiology, moderate exercise can improve exercisers' fitness and functional levels. However, how athletes can control the degree and volume of training during exercise needs to be studied in further experiments.

Table 1. Effects of two groups of body composition indicators after the experiment ($\bar{x} \pm SD$).

	Exercise group	Control group	P value
Body fat ratio (%)	44.4±5.48	44.4±4.98	<0.05
BMI (kg/m^2)	44.8±4.04	45.9±4.14	<0.05
FFM (kg)	44.8±4.88	48.8±5.08	<0.05

Table 2. Effects on the physical quality of college students ($\bar{x} \pm SD$).

	Control group	Exercise group	P value
Sitting forward flexion (cm)	15.75±8.41	10.4±7.75	<0.01
Step index	68±14.56	50±18.11	<0.05
Grip strength (kg)	48.7±5.64	17.7±6.78	<0.05

Table 3. Impact on the skill quality of college students ($\bar{x} \pm SD$).

	Control group	Exercise group	P value
Hexa Jump (S)	18.75±8.41	25.4±7.95	<0.01
Stand on one foot(s) with eyes closed	15.1±8.56	14.4±5.11	<0.01
Reaction time(s)	0.56±0.15	0.74±0.51	<0.05
Leg explosive power (N)	618.9±176.64	419.9±116.78	<0.05

The effect of basketball on the health and fitness of college students

Basketball is a sport that requires both aerobic and anaerobic abilities. In the long-term basketball process, athletes need a healthy level of aerobic endurance. A lot of energy is expended throughout the workout.[10] Therefore, through long-term basketball exercise, all parts of the exerciser's body can be fully exercised. Athletes can also burn off excess body fat at this time. At the same time, basketball belongs to the same field of confrontation.[11] They need physical contact during fights. Strength quality plays a crucial role in this process. Long-term exercise can increase muscle and strength. For college basketball, basketball is mainly for entertainment. During the training, the participants lost fat and gained the power to achieve a good body shape. The improvement of living standards and nutrition has led to insufficient exercise for college students. This can lead to the accumulation of body fat, especially in the abdomen. This can lead to body shape deformation. Colleges need to actively participate in physical exercise, mainly a fun sport like basketball. Basketball can not only have the effect of exercising the body, but also lose weight and plasticity. Basketball helps athletes improve body composition and increases aerobic endurance levels in exercisers.[12]

Basketball has a particular influence on the body shape of college students. The body fat content of the exercise group was significantly lower than that of the control group. The lean body mass of the exercise group was significantly higher than that of the control group. This suggests that basketball plays a role in reducing fat mass, and strength training affects lean body mass.[13] Many studies show that exercise reduces body fat percentage, reducing circulating blood lipids. This is consistent with the results of this study. Therefore, college students have a significant effect on changing their body shape through basketball exercise. At the same time, the flexibility of basketball exercisers has also been improved. Better flexibility can also make muscles and joints better protected. This avoids sports injuries such as muscle strains or joint sprains caused by exertion.[14]

The influence of basketball on the skills and physical fitness of college students

In basketball physical fitness training, physical skill fitness determines the level of basketball competition. College students in basketball mainly focus on fun and entertainment. We selected several representative indicators in the test: strength, explosiveness, agility, and balance. The results show that college students' long-term engagement in basketball can significantly improve their skills and physical fitness indicators.[15]

CONCLUSION

While paying attention to the entertainment of basketball teaching, colleges and universities should strive to develop the education of basketball athletic ability. In this way, the basketball competition level of college students is cultivated. College students' long-term engagement in basketball can improve their cardiorespiratory function. At the same time, the physical shape of students can be improved, and various quality indicators of physical fitness can also be comprehensively improved.

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