

Research on the Current Situation and Countermeasures of Functional Strength Training for Adolescent Campus Basketball Athletes

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Abstract: As a new type of physical training method, functional training has achieved remarkable results in high-level sports teams. However, in the strength quality training of adolescent basketball athletes, functional training has not been widely adopted. This study aims to explore the current situation and countermeasures of strength quality of adolescent basketball athletes, and construct a functional strength training model suitable for adolescent campus basketball teams. Through literature analysis, field research, and empirical studies, it is found that the main problems in the strength training of adolescent basketball teams include insufficient cognition, single content, lack of professional guidance, and weak self-awareness. This study proposes implementation principles such as hierarchical training, gradual progress, and reasonable load, and designs a systematic training method including lower limb, core, and upper limb strength training. Practices show that this model can significantly improve the special strength quality and competitive level of adolescent basketball athletes, providing theoretical basis and practical guidance for the ability improvement of adolescent basketball athletes. Future research will further explore the potential value of functional strength training in psychological quality, team collaboration, and other aspects.

Keywords: Campus basketball; Functional training; Adolescents; Strength quality
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Introduction

The competitive development of basketball has put forward higher requirements for the comprehensive qualities of athletes. As the foundation for executing technical movements and tactical coordination, strength quality directly affects the growth ceiling of adolescent athletes. Although traditional strength training can enhance absolute strength, it has problems such as single movement patterns and disconnection from special requirements, which easily lead to an increased risk of sports injuries. Functional training emphasizes the integrity, coordination, and special adaptability of movements, which can make up for the shortcomings of traditional training. However, the promotion of functional strength training in current campus basketball training still faces challenges such as cognitive biases, outdated methods, and lack of professional guidance. Taking the law of adolescent physical and mental development as the starting point, this paper combines the theories of sports biomechanics and training science to

construct a functional strength training system in line with the characteristics of campus basketball, aiming to provide new ideas for the scientific cultivation of adolescent basketball athletes.

1. Analysis of Physical and Mental Characteristics and Training Adaptability of Adolescent Basketball Athletes

1.1. Physiological Characteristics and Training Load Adaptability

Adolescents are in a sensitive period of growth and development, where changes in skeletal muscle growth rate and hormone levels directly affect the effectiveness of strength training. Studies have shown that the age of 12-15 is the golden stage for the development of lower limb explosive power, while core strength gradually matures after the age of 16 (Smith et al., 2022). Therefore, functional training should follow the "window of opportunity" theory and design differentiated load schemes for different age stages:

Primary stage (6-10 years old): At this stage, students are relatively young and usually new to basketball. The main goals are to cultivate interest, consciously implant the awareness of physical exercise, and adopt an interest-oriented approach. Dynamic balance training is prioritized, using bodyweight exercises (such as single-leg standing while catching and throwing balls) to activate neuromuscular coordination.

Intermediate stage (11-15 years old): This stage generally marks the onset of adolescence, during which students' basic skills show significant improvement. With the steady enhancement of physical functions, the focus shifts to further developing technical and tactical understanding while accepting more systematic physical training. The key is to develop multi-joint linkage ability, and resistance training (such as medicine ball rotational throwing) is introduced to strengthen the efficiency of the movement chain.

Advanced stage (16-19 years old): In this adult development period, athletes typically have certain competition experience and advanced technical levels. Their thinking and actions tend to mature, enabling them to execute complex tactical coordination and positioning. Combining special technical simulation (such as directional jumping followed by shooting) can improve the precision and stability of strength output.

1.2. Psychological Characteristics and Training Motivation Activation

Adolescent athletes have a short attention span and are easily influenced by external evaluations. Surveys have found that functional training incorporating gamified elements (such as "obstacle relay races" combined with core stability exercises) can significantly enhance training participation. Additionally, using real-time feedback technologies (such as wearable devices to monitor movement trajectories) can enhance students' self-efficacy and facilitate the achievement of training goals.

2. Characteristics of Strength Quality in Adolescent Basketball Athletes

Strength quality serves as the foundational condition for rapid and variable technical tactics, and it is a basic physical quality for the physical fitness development of basketball athletes. In strength training, all parts of the body, especially the upper and lower limbs, core, as well as fingers, wrists, knees, ankles, etc., should undergo comprehensive and specialized functional strengthening training. The goal is to comprehensively develop muscle strength and motor

coordination in each movement segment, thereby improving overall physical fitness. In daily strength quality training, high load and intensity are adopted to maximize athletes' functional potential, ensuring that the working muscles achieve maximum tension during contraction. Meanwhile, certain high-load exercises are performed to increase the depth of muscle stimulation. The fundamental purpose of developing strength quality is to enable athletes to withstand heavy loads, continuously accumulate in quantity, progress from non-adaptation to adaptation by increasing the number of repetitions or sets, and then from non-adaptation to adaptation by increasing weight, so that athletes' strength quality can gradually develop.

3.Theoretical Foundations of Functional Strength Training

Functional strength training is a training method aimed at improving motor functions, emphasizing the relevance between training and actual movement actions. Compared with traditional strength training, functional training pays more attention to movement coordination, stability, and explosive power, featuring high pertinence and practicality.

3.1.Internal Logic of Functional Strength Training

The improvement of strength quality not only enhances athletes' explosive power and endurance but also significantly improves movement coordination and stability. Functional strength training provides stronger support for various technical actions in basketball by targetedly enhancing the strength of the upper limbs, lower limbs, and core muscle groups.

3.2.Objectives of Functional Strength Training

Through functional strength training, the aims are to help adolescent basketball athletes:Improve muscle strength and motor coordination;Enhance competitiveness to cope with physical confrontations in games;Prevent sports injuries and extend sports careers.

4.Analysis of the Current Situation and Countermeasures for Functional Strength Training of Adolescent Basketball Players

4.1.Overview of the Current Situation

Strength is the fundamental training for completing technical and tactical tasks. At present, strength training for adolescent basketball teams still mainly relies on traditional training methods. Without good strength as a basic guarantee, it is difficult to sustain the improvement of players' technical and tactical abilities. However, strength training for adolescent basketball teams is still in the initial stage of development, and specialized functional strength training faces dilemmas such as cognitive biases, single-content, lack of guidance, and weak awareness.

4.1.1.Cognitive Bias

Adolescent students and coaches lack a correct understanding of strength training, believing that it is only suitable for high-level athletes rather than adolescents. As a result, they over-rely on traditional training, adopting simple and rough methods of heavy weight and high load, ignoring the role of functional strength training in improving athletic performance and preventing injuries.

4.1.2.Single Content

The strength quality of excellent basketball players comes from the results of long-term systematic strength training. Adolescent basketball teams often rely on random and simple

routine exercises on the basketball court, such as squats, weighted squats, frog jumps, and other strength exercises, which lack pertinence and systematicness. They ignore the need to increase core stability while improving lower limb explosive power.

4.1.3.Lack of Guidance

Functional strength training requires professional knowledge support, but some coaches have insufficient capabilities in training design and practical guidance. They should formulate hierarchical strength training plans according to the specific conditions of the players. It is necessary to avoid implementing a set of training programs for a long time or arranging them arbitrarily. Instead, adjustments should be made following periodic changes to prevent training from deviating from practice and causing the practice effect to be greatly reduced.

4.1.4.Weak Awareness

Athletes often lack awareness of their own state during training, resulting in obvious training effects or even causing sports injuries. Therefore, it is particularly important to enhance self-awareness and cognitive abilities and improve self-focus.

4.2.Innovative Countermeasure Research

Construct an intervention model around four dimensions: hierarchical training mechanism, systematic content architecture, professional guidance system, and self-cognition optimization. Design age-adaptive training programs based on the dynamic hierarchy theory, establish a three-dimensional kinetic chain collaborative training model, develop a coach's cognitive schema iteration system, and innovatively integrate biofeedback and virtual mirror technology to strengthen 本体感知 (proprioception). Through the optimization of the kinetic chain efficiency and the reconstruction of neuromuscular control, form a progressive transformation path of "biomechanical adaptation - technical transfer - cognitive internalization", breaking through the limitations of the separation of physiological and cognitive dimensions in traditional training.

4.2.1.Hierarchical Training System

Based on the dynamic system theory, construct a "biology-technology-environment" collaborative development model, and decompose the athlete's life cycle into three stages: neural adaptation, special conversion, and competitive optimization. According to the dynamic load threshold theory, establish the nonlinear mapping relationship between motor performance and physiological maturity, realize the phase regulation of training parameters through the motor chain efficiency evaluation matrix, and form a ladder 式 (ladder-type) neuromuscular adaptation mechanism.

4.2.2.Systematic Training Content

Based on the energy transfer principle of sports biomechanics, put forward the collaborative training theory of "spatial tension-time sequence". Construct a three-dimensional dynamic chain coupling model, integrate the collaborative mechanism of sagittal plane force conduction, coronal plane stability control, and horizontal plane momentum transfer, form a training content system with topological structure, and realize the isomorphic mapping between motor output and basketball special technology.

4.2.3. Professional Guidance System

Using the complex adaptive system theory, establish the "cognition-behavior-reflection" model of coaches' ability development. Through the construction of cognitive schema of teaching decision-making, the design of practice framework based on dynamic constraints, and the meta-cognitive monitoring mechanism, form a closed-loop professional development system. Introduce the situational cognition theory to optimize the knowledge transfer path and construct an ecological growth model of coaches' professional literacy.

4.2.4. Improvement of Athletes' Self-Cognition

Based on the embodied cognition theory and the closed-loop control theory, construct a "perception-action-representation" ternary coupling model. Use virtual reality mirror training technology to strengthen motor psychological representation, and form a self-correction mechanism through dynamic kinematic marker point deviation feedback. Introduce reinforcement learning algorithms to construct personalized action optimization paths, so that the force output mode and neural control strategy can achieve collaborative evolution in the α - γ co-activation loop, and finally form a motor skill internalization system with self-organization characteristics.

5. Implementation Principles of Functional Strength Training for Adolescent Basketball Players

5.1. Targeted Principle

Design targeted training programs according to the specific performance and development needs of athletes. For example, for athletes in the primary stage, focus on the cultivation of basic strength; for athletes in the advanced stage, focus on the improvement of explosive power and core stability. According to different scenarios and students' own training levels, establish training tasks, take improving basketball (athletic ability) and performance as the main line, arrange appropriate proportions of training content, and make them develop coordinately.

5.2. Gradual Progress Principle

Basketball is a series of training contents from dribbling, passing, pick-and-roll, etc., from simple to complex, from basic to advanced, and always adhere to the principle of gradual progress, and develop the technical points from mechanization to automation. In core strength training, you can start with basic abdominal curl movements and gradually introduce more complex movements such as hanging leg raises. In addition, increasing the training frequency, carrying out necessary intensive training and skill drills every day can help improve physical fitness and competitive performance.

5.3. Reasonable Load Principle

Scientifically set the training load according to the actual level and training objectives of the athletes. Adjust it as appropriate with the progress of the phased training plan, and the corresponding 运动负荷 (exercise load) will also be adjusted. When adjusting the training exercise load, the change of the exercise load and the body adaptation show a good fit, so as to form a good stimulation phenomenon. In the primary stage, light equipment can be used for low-intensity training; in the advanced stage, the training intensity and equipment weight can be gradually increased.

5.4.Multilevel Principle

Multilevel training mainly aims at the lack of basketball players in speed, strength, endurance, flexibility, and coordination. Through multi-dimensional training design, the effect of comprehensive improvement is achieved. In addition, it is also necessary to comprehensively consider many factors existing in training, including training content and time, training intensity and density, nutrition, health care, and rest recovery, etc., formulate more efficient and reasonable diversified training plans, and realize a systematic training model.

6.Functional Strength Training Methods for Adolescent Basketball Players

6.1.Lower Limb Strength Training

(1) Squat Training Method: Place the barbell on the deltoid muscle of the neck, keep the feet shoulder-width apart, keep the back straight, squat until the thighs are slightly lower than the horizontal plane, choose half-squat or full squat according to the load, and use the thigh strength to stand up quickly.

(2) Lifting Exercise Method: Feet shoulder-width apart, hands holding the barbell, keep the back straight, lift and lower the barbell by extending the hips and knees.

In daily classroom teaching, for safety reasons, equipment training items such as barbells are less used. However, basketball training teams regularly and systematically carry out lower limb strength enhancement programs. Generally, barbells of different weights are used according to students' physical fitness and body weight to make the training more hierarchical, targeted, and efficient. Specifically, after athletes fully activate all joints, they complete 10–15 repetitions per set according to their body size, alternate between the two exercises, take 4–5 sets as a training unit, and add extended contents such as short-distance sprints to make the training more comprehensive.

6.2.Core Strength Training Methods

Actions commonly seen in games, such as body collisions, cutting and pick-and-roll, and rebound confrontations, expose the problem of weak core strength in athletes. Therefore, functional strength training in the core area is crucial for improving athletes' motor abilities.

(1) Crunch Leg-Press Exercise: Place hands on both sides of the gymnastic mat, keep the body and feet at a 45° angle to the ground, and rely on thigh contraction to perform rapid leg-press movements.

(2) Hanging Leg Raise Exercise: Use a horizontal bar to hang with both arms, keep the legs suspended, and raise the legs to a 90° angle with the body by (abdominal contraction).

(3) Two-End Raise Exercise: Lie on the gymnastic mat, stretch both arms and legs, and raise both ends simultaneously.

Such core strength training can be easily implemented in daily classes with relatively low safety requirements. However, sufficient warm-up activities are still needed, especially stretching of the shoulder, neck, waist, and back joints. In classroom design, different task areas can be used for alternating exercises, and regional check-ins can be carried out in the form of tasks to strengthen the core in a fun and relaxed way and inspire students to enjoy learning and exercise.

6.3.Upper Limb Strength Training Methods

(1) Pull-Up Exercise: Use hanging bars and swinging movements to independently complete

pull-ups, with the chin exceeding the horizontal bar.

(2) Front Swing Arm Exercise: Feet in a front-back stance, body slightly forward-leaning, center of gravity on the front foot, hold dumbbells and swing alternately back and forth. When swinging, use the shoulder joint as the axis, and keep the core stable without swaying left and right.

(3) Hanging Bar Exercise: Hang on the horizontal bar with hands shoulder-width apart and maintain a static state for a certain period.

In classroom training, simple props and equipment are used. The teacher's teaching content design should differ from the exercise order of lower limb and core strength, with difficulty decreasing from hard to easy and from dynamic to static. For front swing arm exercises, students can use small water bottles they bring, flexibly developing and using daily props.

6.4.Explosive Strength Training Methods

(1) Wrist Flexion and Extension Exercise: Team members hold a small dumbbell in one hand and perform rapid wrist flexion and extension with a straight arm.

(2) Weighted Calf Raise Exercise: Perform continuous calf raise exercises with a certain load of barbell, focusing on strengthening lower limb explosiveness and ankle stability.

(3) Resistance Band Exercise: Put the resistance band around the waist and abdomen of the trainee, who performs resistance sprinting while an assistant pulls the resistance band from behind with a certain resistance.

6.5.Strength Endurance Training Methods

(1) Uniform Endurance Running: Carried out in groups, set a running distance of 2000–3000 meters, and no slowing down or stopping midway.

(2) Lunge Jump: The landing length of the front and back feet refers to the distance of the first stretching action in regular training. When exchanging legs, the feet are about 20–30 cm above the core position, and the upper body remains straight and relaxed.

(3) Multi-Level Shuttle Run: Designate a certain distance on the sports field as the shuttle point, use the rhythm of physical fitness test music as the interval for round trips. As the rhythm speeds up, increase the stride and frequency without changing the distance, and complete the shuttle at the corresponding time node.

(4) Continuous Fast Break: Form a training group of 2–3 people, continuously perform cross-running fast breaks. After completing one fast break, pass the ball to the frontcourt, and team members quickly sprint to catch the ball and complete a fast break layup.

In regular teaching and training, coaches can adapt the training intensity and sets according to the actual level of basketball players based on the above contents. It should be noted that the above training contents are not single training plans. They can be combined with speed, flexibility, explosiveness, etc., for targeted combined training. Meanwhile, apply highly practical training means such as scenario-based combat confrontations and prop confrontations to better exert the effect of functional strength training.

7.Conclusion

Strength quality is an important foundation for adolescent basketball players to improve their game level. As a scientific and efficient training method, functional strength training can significantly enhance their muscle strength, motor coordination, and comprehensive quality.

This paper analyzes the current situation and problems of functional strength training for adolescent basketball players and proposes targeted countermeasures and implementation principles. Future research should further explore the paths to improve the psychological quality and team collaboration ability of adolescent basketball players, contributing more to the development of youth campus basketball in China.

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