COMPARING OF WEIGHT TRAINING AND FUNCTIONAL TRAINING ON JUMPING PERFORMANCE IN ADOLESCENT BASKETBALL PLAYERS

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COMPARING OF WEIGHT TRAINING AND FUNCTIONAL TRAINING ON JUMPING PERFORMANCE IN ADOLESCENT BASKETBALL PLAYERS

BY

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HAS BEEN APPROVED BY THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT
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This study aimed to compare the effects of weight training and functional strength training on jumping performance in adolescent basketball players. Thirty male athletes from the men's basketball team at China Jiuquan Vocational and Technical College were recruited and divided into three groups: weight training, functional strength training, and a control group (n=10 per group). Leg muscle strength was measured using high jump tests at baseline, after 4 weeks, and after 8 weeks of training. Data were analyzed using SPSS software to calculate the mean differences and standard deviations across groups. Two-way repeated measures ANOVA was conducted to assess changes in leg muscle strength over time, with Bonferroni post-hoc tests applied for pairwise comparisons when significant differences were observed. The results revealed a significant difference in leg muscle strength between the control group and the weight training group ($p < 0.05$). Although no significant difference was found between the weight training and functional strength training groups, both demonstrated improvements in jumping performance. These findings indicate that weight training and functional strength training play essential roles in enhancing jumping performance by improving take-off speed, endurance, and whole-body coordination. Comprehensive training programs should integrate strength, speed, and coordination exercises alongside technical skill development to optimize performance.

Keyword : Weight training, functional strength training, jumping performance, adolescent basketball players

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JIN ZHONG CUI

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CHAPTER 1
INTRODUCTION

Introduction

The modern game of basketball was invented in 1891 by James Naismith, a physical education teacher at the YMCA Cadet Training School in Springfield, Massachusetts (USA), and was invented because it was a source of enlightenment and inspiration for children's games (LI, 1991).

James Naismith was inspired by the Canadian children's game of "DUCK-ON-A-ROCK", in which a ball is thrown into a peach box, during his tenure as a teacher, and completed the conception of the game of basketball on 15 November 1981.In 1892, the YMCA of Springfield, Massachusetts, USA, established the YMCA Rules of Basketball. The YMCA Basketball Rules were established with 13 rules (Sun, 2020).

In 1915, the United States unified basketball rules, and translated various types of ink published overseas; in 1932, FIBA to USA colleges and universities to exercise the rules of basketball as the basis for the first creation of international norms and principles of the game, and the creation of the FIBA. 1936 1936, men's basketball included in the 11th Olympic Games official competitions (Zhu, 2022).

In 1950 and 1953, the World Men's and Women's Basketball Championships made their official debut (Liang, 2020). 1968 saw the creation of the Foreign Minor Basketball Federation; in 1976, men's and women's basketball were included in the official competitions of the 21st Olympic Games.

Basketball is a physically demanding sport that has developed a great competitive nature (Jack Ransone, 2017). In basketball, competing teams score points by shooting the ball into each other's baskets (Siddell, 2014). Two teams consisting of five players each play a game, each game is divided into four quarters of 10 minutes each for a total of 40 minutes, when the game is tied after the four quarters the game is played, at that point an extra five minutes is added, and if there is still no winner after five minutes of extra time, a second extra five minutes is required until one side scores

more than the opponent before the game can end and the one who scores more points wins the game (Zhong, 1993).

Players must be skilled in all aspects of the game, including dribbling, shooting, passing, defense and offence. Coaches develop offensive and defensive schemes to help players protect the basket. Players are not allowed to make contact, grab or block aggressive body movements by opposing players. Players move their feet and posture defensively to help the defense contain the attacker. The only way to get the ball from another player is to steal or cap the ball without hurting the opposing player.

Basketball is a carrier of a worldwide sporting culture and a tool for cultural intermingling and sharing among nations and peoples. People's participation in basketball activities not only enriches people's lives, but also improves the quality of their social life and promotes the harmonious development of human society (Ondari-Okemwa 2011), and it can cultivate basketball players' sense of unity and fraternity, collective honor, tenacious quality of will and the spirit of struggle, improve the functioning of the human organism, enrich the business and cultural life, and improve the efficiency of learning (National Physical Education Academy Textbook Committee, 1994).

Basketball, as a modern sport, has certain educational attributes that existed before its birth, and the co-ordination exercises between players, technical and tactical exercises, and the teaching of the rules of the game in basketball belong to a kind of educational behavior (Zhao, 2016).

Basketball as a sport, it is extremely confrontational, challenging, fun and ornamental, contributing to fitness, intelligence, and unlocking the human potential of an excellent sport. As a participant in basketball, experiencing a sense of success after winning and a sense of failure after losing, both success and failure, the sportsman will continue to learn the techniques and tactics of the sport and so on. This is because success after winning is pleasurable and motivates the player to continue to learn and achieve more success. Failure after losing makes one depressed, resentful and must learn twice as hard in order to beat the opponent (Graham McFee, 2012). Therefore

modern basketball not only has rich cultural connotations and educational value, but also greatly helps the physical and mental health of young people, physical learning ability and so on.

Functional training is a new type of competitive sports training, is often used to improve spinal stability in the field of fitness and rehabilitation of some of the training methods and means used in the training process of athletes, which plays a pivotal role in improving the level of athletes' competitive ability, preventing athletes' injuries, and accelerating the fatigue recovery process. This plays a pivotal role in improving athletic performance, preventing injuries and speeding up the recovery process from fatigue. He considers the human body as a whole and focuses on the overall functioning of the body, requiring the different parts of the movement chain to achieve the overall movement accuracy, thus preventing the interference of one part of the chain with the overall functioning of the body as a whole in a practical way (Gary, 1997).

Weight training is some training carried out by increasing the load when the body is in a stable state, mainly targeting the large muscle groups of the body, including the upper and lower limbs and waist and abdomen. Through the stimulation of suitable loads, thus increasing the number of muscle fibers and the cross-sectional area of muscles, so that the muscle strength, speed, endurance and so on are improved in the way of exercise (Zhou, 2018).

Weighted training is primarily trained with appropriate loads, multiple sets, high density, and slow speed. Weight training focuses on individual muscle development, where muscle strength increases along with muscle size. The basic methods of weight-training mainly include dynamic isometric contraction training, static isometric contraction training, isokinetic contraction training, super isometric contraction training and circuit training method; its training means include weight-bearing resistance exercises, antagonistic exercises, overcoming the resistance of the external environment, and other seven major exercise means (GRAY C). Strength training using the above training tools can be broadly divided into two parts: upper limb strength

training and lower limb strength training, generally using deep squat, bench press and other exercises for training.

" Jumping performance " is also known as "Jumping ability" or "Jumping power", and all three of these terms indicate the same concept, unless otherwise specified. Jumping power refers to the lower limbs and the whole body through the coordination of force, so that the human body quickly jumped up in the air. Jumping performance is a comprehensive quality, training must grasp the power, speed and coordination of these important factors, but also with the combination of technical training (Sun, 2004). Jumping power is a system, and the typical physical quality elements in the Jumping power system consist of lower limb strength, speed and jumping endurance, and the uncoordinated proportion between the quality elements is the main reason for the structural internal friction in the Jumping power system, which is a negative factor in the Jumping power system (Yao, 1989). Although there are differences in the above concepts, it is recognized that Jumping power is a comprehensive quality, which is a reasonable combination of strength, speed (mainly referring to the speed of muscle contraction), technique and other qualities.

Adolescent basketball training is an important part of the development of basketball, is an indispensable part of the sustainable development of basketball in China, one of the main characteristics of basketball is that a large number of actions need to be completed in the air, basketball players want to successfully complete a variety of aerial action and get the advantage of the air must have a good jump quality. Therefore, in the physical quality training of basketball players, jumping performance training should be a very important content. However, in the existing training process, many teams do not raise the jumping performance training to the corresponding height. Compared with foreign countries, there are still many shortcomings in the scientific training of basketball, in order to improve the jumping performance, it is necessary to use sports science training methods. Functional training method is in this background into the vision of China's basketball trainers, but in the field of basketball training, there are few related training applications to improve the jumping performance of basketball

players. Therefore, this study selects adolescent basketball players with a certain level of competition as the research object, through the imposition of functional training means, to explore the impact of functional training on the jumping performance, the application of functional training in basketball practice to carry out theoretical analysis and experimental validation for the reference of the coaches and athletes, with a view to contributing to the process of promoting the scientific training of young basketball players. We hope to contribute to the scientific process of promoting the training of adolescent basketball players.

Objectives

1.Study of the effects of weight training and functional training on the jumping of adolescent basketball players.

2.Compare the effects of weight training and functional training on the jumping of adolescent basketball players.

Importance of research

1.To know the effect of weight training and functional training on jumping in basketball.

2.To apply research results to athletes.

3.To develop the abilities of athletes more efficiently scope of study.

Scope of the Study

This paper takes the effects of weight training and functional training on the jumping of adolescent basketball players as the research object. Due to the limitation of basketball beginners by their own athletic ability, and in order to ensure the scientific and rationality of this study, the experimental subjects selected in this paper are the men's basketball team of Jiuquan Vocational and Technical College, with a total of 18 players. Before the experiment, the athletes were tested for their special jumping and divided into a weight training group and a functional training group, with 9 people in each group.

variables studied

1.Independent variables

1.weight training program

2.functional training program

2.Dependent variables

1.Jumping performance

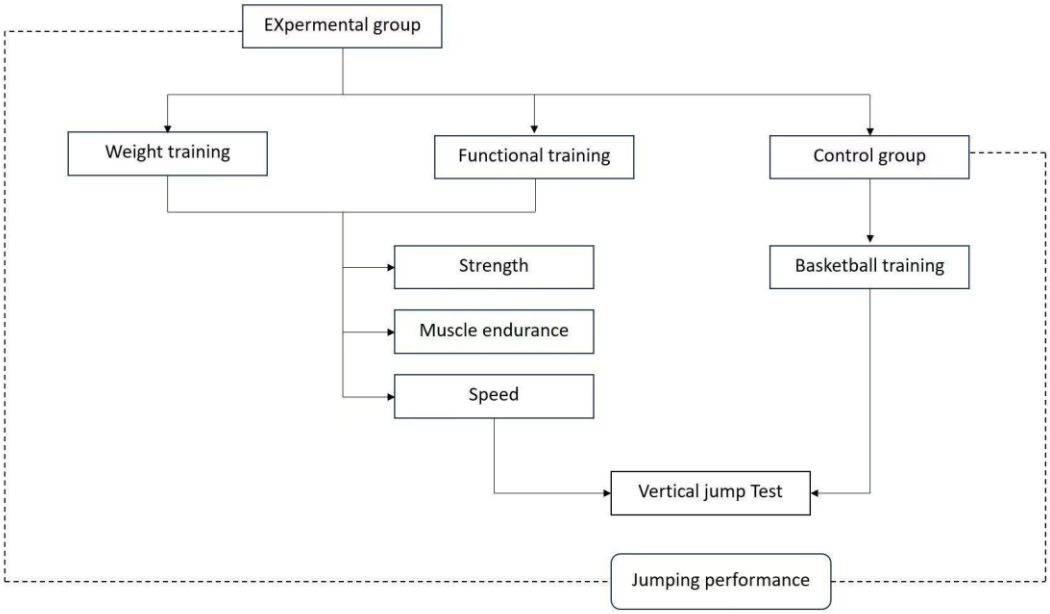
Definition

1. Functional training (FT) is a training method that improves the ability of specialized sports, strengthens the core and makes the neuromuscular system more efficient.

2.Weight training, also known as weight training, is training that helps build strength. Muscles are strengthened by using weights such as barbells and dumbbells as resistance.

3.Jumping performance, also known as Jumping, is from the point of view of physics is the athlete through their own work on the ground, and then use the reaction force to obtain upward acceleration, so that the human body to vacate the process, jumping is the embodiment of the speed of muscle explosive force, is the whole body explosive force on the ground caused by the kinematics of the results.

Framework



Hypothesis

1.Effects of weight training and functional training on jumping performance is different

2. Jumping performance of the experimental group and control group before training after training are different

CHAPTER 2
REVIEW OF THE LITERATURE

From studying related documents and research. It appears that there are enough relevant documents and analytical reports. It can be summarized as in the next topic.

1.Related concepts

1.Weight training

2.Functional Training

3. Basketball Players

4. Jumping performance

2.The effect of weight training on jump height in adolescent basketball players

3.Application and effects of weight training in adolescent basketball players

4.The effect of functional training on jump height in adolescent basketball players

5.Application and effects of functional training in adolescent basketball players

6.Literature review

Related concepts

weight training

Weight training is an exercise training that aims to increase muscle strength and volume (Huang, 2016),usually refers to the exercise training that relies on or with the help of heavy weights (the weight or resistance of dumbbells, barbells, and other equipment) to make the contraction of skeletal muscle tissues in different parts of the body (centripetal contraction or centrifugal contraction) to produce reflexive force, resisting neutrality, in order to increase the strength of the muscles, develop the clusters, and improve the endurance (Liu, 2014).It is one of the most basic training methods in sports. The above is a broad definition of weight training, which means that

strength training with the help of external weight can be regarded as weight training. In this article, weight-bearing training refers to the human body in the load of a certain external gravity to carry out a variety of physical exercise. Commonly used exercises include sandbags tied to the legs, sandbags wrapped around the waist, or wearing a sand suit (Tao Li, 1994), and the specific weight will be adjusted according to the different sports, which is a narrower definition of weight-bearing training.

The principle of weight training in the narrow sense is the body's adaptive mechanism. By applying additional stimuli to the body during regular specialised training, the muscles are constantly adapted, and while adapting, the muscles develop towards the technical movements of specialized training in terms of energy supply, morphology, structure, and force generation, gradually adapting to exercise under load, so that the athletes can obtain a direct qualitative enhancement in the training process.

Weight training, as a common training tool, is widely used in speed events, in sprints, middle and long-distance running, jumping and other sports.

Carmelo Bosco et al. in "The Effect of Weight Training on Muscle Properties in Athletes", compared the results of the same training session with 14 of the highest level sprinters in the country at the time, who wore a special weighted vest weighing 7-8% of their body weight, with and without a weighted weight, and concluded that a short period of weight training did not have much of an effect on the athlete's enhancement, but that weight training was able to produce morphological adaptations in the muscular tissues. However, weight training is able to produce morphological adaptations in the muscle tissue, improving certain muscle characteristics that are stimulated in the regular state, and specializing the level of strengthening in certain areas of the muscle that are not strengthened in the regular state (Carmelo Bosco, 1987).

Yuan Zuosheng in the "small sand leg guards for fast running training in the preliminary test" chose to use small sand leg guards to train sprinters, after two years of research and observation, found that the negative small sand leg guards for sprint training can effectively improve the sprinters' stride length, for the stride frequency of the

enhancement of the existence of the impact, but in combination, the athlete's speed is the overall enhancement of the (Yuan, 1984).

Zhai Fang, in "The effect of weight training on the performance of middle-distance runners in secondary schools in Henan Province", designed an orthogonal test to train athletes with a combination of weight bearing, speed training, and endurance training, and concluded that the factors affecting the athletes' performance of the 800-metre run were in the order of weight bearing, speed training, and endurance training; of which the optimal combination of training was a combination of weight bearing of 3%, 100-metre x 6, and 3,000-metre training program (Zhai, 2011).

In "Experimental Study on the Effect of Weighted Vest and Ankle Weight Training on the Performance of Running and Jumping Events", Zhang Juli and Yang Yan compared conventional strength training with the combination of weighted vest and ankle weights, and found that both weighted vest and ankle weight training and conventional strength training were effective in improving the performance of running and jumping events, but the group wearing weighted vests and ankle weights spent less time and improved their performance more quickly. However, the weighted vest and ankle weight training group took less time and improved performance faster. It is also pointed out that weighted vests should be used as much as possible during regular training, and ankle weights will increase the chance of ankle injuries (Zhang Yang, 2006).

Shi Xingnan in the "vertical resistance class sprinting special strength training means training effect empirical research" for track and field special students for a period of 8 weeks, three times a week, negative incremental weight sand vest repetitive running special strength training. The analysis of physical quality, kinematics and link muscle strength related indexes before and after the experiment found that weight training can effectively improve the athletes' sprinting and standing long jump performance; hip flexor and extensor muscle group muscle strength and explosive force increased significantly, and the knee flexor and extensor muscle group strength did not change much, but the development was more balanced (Shi, 2016).

Wang Yali in "Experimental Study on the Characteristics of Myoelectric Changes in Explosive Turning Movements of Basketball Players", through the practice of turning movements in the unarmed state and the state of increasing load, the detection of muscle electrical signals of the subjects found that the contribution rate of the same muscle before and after the turning movements in the case of increasing load was basically the same, but with the increase in load, the arousal rate of the muscle increased, the arousal time was shortened, and the lower limb muscle group discharge time increased, and the external abdominal obliques were also involved in the movement. It is proved that weight training can effectively improve the development of lower limb explosive strength, and at the same time can improve the stability of abdominal muscle strength during turn-training (Wang, 2017).

Yu Runsheng in the "Study on the effect of negative different weight sand vest running on the lower limb special strength of sprinting end route running" (Yu, 2013), Li Li et al. in the "Experimental study on the effect of weight training on the performance of middle and long-distance runners" through the use of homemade adjustable weight training clothes on the 800-metre running athletes in the real (Li, 2017), and came up with the primary and secondary order of the factors affecting the performance of the 800-metre running as the weight of the negative weight, speed training, and endurance training. Among them, weight-bearing training contributes to the improvement of sports performance, but the weight-bearing weight is not the greater the better. From no weight bearing to increasing weight bearing, the performance is the first to improve and then decrease.

In summary, weight training is widely used to improve the lower limb strength of athletes, especially for the lower limb explosive force training. At the same time, most of the application programs are short-distance sprint running and jumping. This is very similar to the basic movement of basketball. Basketball requires athletes to be able to accelerate, decelerate, jump and change direction in a short period of time, and according to previous studies, weight-bearing training can effectively improve the above qualities of athletes, so it is feasible to try to introduce weight-bearing training into

the soft ladder training for the above qualities. Meanwhile, according to the literature, when carrying out weight training, the principle of gradual progress should be followed, and the maximum weight should not exceed 20%. After weight-bearing training, we should relax in time to avoid muscle injury, and at the same time, in the process of weight-bearing training, we should observe the trainee's body, and if there are symptoms of maladaptation, we should reduce the weight or stop weight-bearing in time.

Functional Training

Functional training early originated in the field of sports rehabilitation, with the rapid development of competitive sports, in the early 1990s, some foreign scholars cited this kind of strength training to the field of competitive sports, after the study found that this kind of strength training not only can effectively prevent injuries during training, but also to a certain extent, can improve the quality of the organism to complete the action in the training.

Functional training All known as Functional training, which is in line with the current means of rehabilitation, rehabilitative muscular strength training carried out for a single session to effectively regulate the control, balance, stability, and co-ordination of the nerves of the muscles between individual muscles (Kidgel, 2017)

According to Groters S et al: Functional training is the rehabilitation of neuromuscular control through the perceptual co-ordination of all parts of a muscle group as a means of achieving effective control of muscle tone, body joints and other aspects of the body in order to provide enhancement of proprioception, rehabilitation is mainly carried out in the form of exercises, relating to stability, emergency stops, ankle speed increase and decrease in multiple planes and joints. loaded movements of the ankle joint, where the rehabilitator can readily regulate and control instability, with the key point being the ankle-centred target region above the coordinated utility of the system (Groters, 2013).

Wang et al. suggested that in the process of training practice, it is necessary to clearly distinguish between the concepts of functional training and

functional training. Functional training can be effectively composed of functional training, and functional training as a comprehensive concept covers a wider range of content, in addition to strength, but also includes endurance, speed, etc. For athletes, functional training is conducive to identifying their physical weaknesses at an overall level, which has positive implications for the subsequent development of specialized training programs. For athletes, functional training can help to identify their physical weaknesses on a holistic level, which is positive for the subsequent development of specific training programs. Functional training puts more emphasis on the training of strength as a physical quality, which is targeted and comprehensive. On the one hand, it emphasizes the effective coordination between different muscle groups to give full play to the strength of different muscle groups, which is conducive to achieving the stimulation and mobilization of each core muscle group, which can effectively improve the reaction force of muscle groups, and also has a positive significance in improving the flexibility of athletes' muscles. On the other hand, through functional training, it is conducive to determining the mechanism of force generation of a certain technical movement, and on the basis of a full understanding of its deep-rooted rules, it is possible to determine the deficiencies of its strength, so as to formulate a more effective training program and continuously improve the coordination level of its force (Wang, 2014).

As early as 1996, Cress and other scholars proposed that, compared with traditional strength training methods, functional training has significant advantages in terms of training concepts, methods and effects, which is conducive to the clear improvement of the athletes' special strength, and it is an important way to realize the in-depth fusion of strength quality and technical and tactical movements. Through scientific functional training for athletes, it is conducive to improving the athletes' control of muscle groups, thus improving their body coordination, and strengthening their athletic ability while training them to achieve higher levels of specialized technical movements to achieve the expected training goals (Cress, 1996).

Gray's more comprehensive and in-depth study of FST is called Functional training (FST), which explains the human body movement as a whole, and believes that FST is conducive to a more comprehensive understanding of the intrinsic law of muscle strength, clarifies the deficiencies of strength quality, and improves the effect of training by means of targeted specialized training, so as to improve the co-ordination and control of the muscle groups (Cook, 1997).

Gambetta V V pointed out on the basis of research, according to the physical characteristics of athletes, combined with the technical characteristics of specific sports to develop functional training, is conducive to the overall training of the body's entire muscle group, to strengthen the athlete's ability to control the body's muscles and coordination of the ability to have a positive significance. In addition, functional training is an important means of improving athletes' physical fitness and athletic ability, as it incorporates proprioception into the training process, plays a targeted role in improving the stability of the athlete's body muscles, and improves the athlete's ability to control the muscles of the body (Gambetta, 1999).

SantanaJ.C., on the basis of research studies, considers functional training as an activity that integrates movements from competitive events with movements from everyday life (Santana, 2000).

According to Steven Plink et al, functional training is the incorporation of a number of energetic, co-ordinated and mechanically characterized exercises into everyday life (Steven Plink, 2006).

Huang and other scholars have found through a lot of research and practice that functional training is conducive to improving the stability and coordination of muscle groups, and has a positive impact on strengthening the control ability of exercise on one's own muscle groups. The scholars took 11 baseball players as research samples, and through functional training, the centrifugal force of the athletes was clearly improved, and their lumbar muscles were strengthened. At the same time, after the functional training, the coordination of the lower back was improved to a large extent,

which had a positive impact on improving the athletes' physical fitness and athletic ability (Huang, 2011).

Swanik et al. analysed the effectiveness of functional training in a sample of 26 swimmers. The results of the study showed that the incidence of shoulder pain was significantly reduced and the shoulder muscles were significantly strengthened after the functional training (Swanik, 2002).

Michael Boyle suggests that the holistic alignment of muscle groups is a key component of functional training, and that there is a link between this and targeted training, which greatly improves coordination between the various muscle groups of the body and facilitates the athlete's control of the body's muscle groups (Michael, 2007).

This viewpoint is also more recognized by Thompson et al. In addition, the scholars suggested that the implementation of functional training for athletes is conducive to the improvement of human movement coordination on the one hand, and on the other hand, through the targeted training of muscle groups, it is conducive to the promotion of the in-depth integration of strength literacy and technical and tactical movements. The scholar also pointed out that combining theoretical knowledge in the field of anatomy to design scientific training methods is essential to improve athletic performance (Thompson, 2007).

James C. Radcliffe pointed out on the basis of the controlled study that functional training refers to training methods that match the training action and the needs of the sport. Therefore, the strength training carried out to meet the needs of a certain sport is functional training, therefore, there is no need to be too rigid in functional training methods, and functional training program can be obtained through the optimization of traditional training methods. To achieve the goal of improving the athletes' special sports ability. In this way, on the one hand, it ensures the integrity and effectiveness of strength training, and on the other hand, it is conducive to the in-depth integration of strength qualities and technical movements, and it strengthens the athletes' specialized athletic ability while achieving coordinated power generation (James, 2010).

Li Danyang et al. summarized the existing research results of functional training, and pointed out that functional training is a kind of training method between special strength training and general strength training, which on the one hand pays attention to the training of physical strength quality, and on the other hand emphasises on the training of locomotor function, and fully integrates the proprioception and strengthens the coordination and cooperation between the nervous system and the muscular system through the organic linkage of multiple joints and muscle groups, so that it strengthens the individual's physical quality and improves their special sports ability at the overall level (Li, 2011).

Chen Changzeng pointed out that: the integration of functional training with the basketball special techniques of general high school female basketball players, the game characteristics of basketball and special technical training methods for effective (Chen, 2019) and safe integration, and for the general high school female basketball players, the analysis of its jump shot hitting rate, neuromuscular control and the overall coordination are significantly improved, and the fusion of the game characteristics and the steering technique of the comparison, it is necessary to pay attention to the athletes' body index change status, reduce the incidence of injury and disease, and play a positive role in the improvement of the quality of the functional training.

In summary, experts and scholars have emphasized three basic characteristics of functional training: firstly, integrity; secondly, stability; and thirdly, balance. For athletes, functional training aims to strengthen their specialized athletic ability by stimulating the nervous system and muscle groups to perform various athletic movements, so as to meet their specific athletic needs. In terms of human strength training, functional training puts great emphasis on the theory of motor chain, on the one hand, it stresses the continuous stimulation of collective large muscle groups, in addition, it stresses the stimulation of small muscle groups in joints, in addition to this, this strength training, it requires that athletes in different sports to carry out training means design, it is necessary to base on the physical quality of athletes, combined with the specific characteristics of the technical movements of the sports, to develop an

effective strength training program. Effective strength training program, by improving the relevance of its strength training, to achieve the goal of improving the athletes' special sports ability. Through this way, on the one hand, to ensure the overall strength training and effectiveness, on the other hand, is conducive to the depth of the integration of strength and technical movements, in order to achieve the coordination of power at the same time, to strengthen their special sports ability.

Adolescent basketball players

The 2004 edition of the Dictionary published by the Shanghai Dictionary Publishing House defines adolescents as: adolescents refer to the period in the human life cycle between childhood and adulthood, which is usually referred to as the teenage years, and usually undergoes the puberty period of sexual maturity during this period, but because of the differences between individuals and the genders, the age of puberty of both men and women fluctuates to a certain extent, and in the case of males, adolescents are generally referred to as the age group of between 14 and 21 years of age.

The Encyclopedia of China divides adolescence into two stages: juvenile (also known as childhood, 11-14 years old) and early youth (15-18 years old), which is a stage of life that begins in adolescence and continues until the individual acquires the abilities and responsibilities of adulthood, and is also the period of transition from mid-childhood to adulthood. According to Zhong Bingshu, adolescents are those who are in the middle school to high school graduation age group, and the Youth Olympic Games organized by the IOC only accepts competitors between the ages of 14 and 18, while the Youth Games in China accepts competitors up to the age of 19 (Zhong, 2020).

The 2012 edition of the Chinese Youth Basketball Training Syllabus divides the training of adolescent basketball players into five age groups, namely, U10 (under 10 years old), U12 (11-12 years old), U14 (13-14 years old), U15 (15-16 years old) and U18 (17-18 years old), with reference to the FIBA and Asian Basketball Confederation's Youth Basketball Competition System as well as Basketball Athletes Selection, From the perspective of FIBA, Asian Basketball Competition System and basketball player

selection, initiation training, the initiation training of athletes around the world usually starts at the age of 7, and the boys will show their best performance in their life at the age of 18, and the girls will show their best performance at the age of 23. In the following years will maintain a relatively stable state, the whole training process can last 20-30 years, in this whole period, the training process is usually divided into different phases, the first stage is the initiation period, mainly for the preparation of training, the age of 7-8 years old; the second stage is the primary foundation stage, at the age of 9-12 years old children; the third stage is the comprehensive foundation stage, the age of 18-19 years old; the third stage is the comprehensive foundation stage, the age of 18-19 years old children; the third stage is the comprehensive foundation stage, the age of 18-19 years old children. The third stage is the full basic stage, which covers the age range 18-19 years; the fourth stage is the high level stage, which refers mainly to the age range 20-25 years; and the last stage is the maintenance stage, which covers the age range 26-36 years.

Jumping performance

It is mentioned in the Advanced Basketball Course that many technical movements in basketball need to be performed by players in the air. Therefore, players should learn to jump with one or two feet, and be able to jump in different directions and continuously in the same place, under running and confrontation conditions, and to jump fast, high, and with a long lag time, so as to better complete various technical movements in the air (Sun, 2004).

Han Qiu mentioned in the Research on Bouncing Training of Basketball Players that basketball players' bouncing has randomness, and there are many kinds of jumping movements. Jumping in place, jumping with two feet in a hurry, jumping with two feet in a stride and jumping with one foot in a run are the most used in the game, of which jumping in place and jumping with a run account for almost half of the percentage each (Han, 2011).

Fang Da quan mentioned in the training of basketball players' jumping force that basketball jumping force has the characteristics of diversity and randomness. Diversity means that athletes can jump in a variety of ways in layup, which can be single-footed jump, double-footed jump, in-situ jump and assisted running jump. Casualness refers to the athletes in the face of different situations, random state jumping, which is the test of the athletes' bouncing strength, requiring athletes to jump high under the casual bouncing, able to jump continuously, and last a long time (Fang, 2015)

Xu Bo found that in basketball games, athletes need excellent Jumping performance to support their jump shots, blocked shots, and rebound attempts. When using different jumping techniques, jumping with both feet in place, jumping with both feet in stride and jumping with one or both feet after running are the most common (Xu, 1998).

According to Wang Jiahong, "Ball Games - Basketball", jumping is a method of movement in which players strive for height or distance on the court. There are two methods of jumping, the two-footed jump and the one-footed jump (Wang, 2018).

To sum up, basketball players' special jumping performance mainly refers to: in basketball games and training, athletes are able to skillfully and flexibly use in situ two-footed jump, stride two-footed jump, assisted single two-footed jump and continuous two-footed jump technology to fight for the height of confrontation ability.

The effect of weight training on jump height in adolescent basketball players

Liu Beixiang et al. in the study of "Maximum Momentum Training Method" for the development of muscle explosive force determined the appropriate loads to be used by the subjects according to the kinetic data obtained. The following conclusions were drawn from the experiments:1. When the load volume changes, the muscle output impulse when the human body completes the movement is different, and there are extreme values.2. Using the load volume corresponding to the extreme value of the output impulse to train the muscle strength can develop the explosive power of the muscle more effectively.3. The method of using kinetic indexes to determine the load

volume reasonably takes into account the human body's self-weight, the difference of different exercises, the difference of the muscle composition and the speed of completing the movement, etc., so that the strength of the body will be improved by the load volume. Completion of the movement speed and other issues, so that the strength training is more targeted, accurate and effective. Liu Jun in the maximum momentum training method on running, jumping basic movements in the "maximum momentum training method" on seven athletes for a period of three months of training, the results found that: "maximum momentum training method" can change the lower limb muscle groups contraction force coordination It was found that "Maximum Momentum Training" could change the coordination of contraction and force generation of lower limb muscle groups, and improve the running and jumping skills of athletes through the improvement of the strength status of lower limb muscle groups (Liu, 1994).

The book "Information on Sports Abroad" states that high jumpers are advised to use exclusively 30-90 per cent weight-bearing exercises in their preparatory explosive exercises.

Zhang Jiuli,Yang Yan in the experimental study of the effect of wearing weighted vests and ankle weight training on the performance of running and jumping events: through the review of relevant literature and expert interviews, experiments, and analysis of the data obtained, it was concluded that the performance of wearing vests and ankle weight training is significantly higher than that of the control group, and pointed out that: the effect of wearing weighted vests and ankle weight training group and conventional weight training group on the performance of running and jumping events is very significant, wearing vests and ankle weight training group compared with conventional weight training group, has the benefit of spending less time and improving performance faster. It is also pointed out that: the effect of wearing weighted vest and ankle weight training group and conventional weight training group on the performance of running and jumping items is very significant, Guangzhou Sports Institute 2017 Master's Degree Dissertation 6 wearing weighted vest and ankle weight training group compared with the conventional weight training group, has the advantages of spending

less time and improving the performance quickly; wearing weighted vest weight training in the early stage of training, must be done in a gradual manner, and gradually improve (Zhang, 2006).

In a comparative study of changes in vertical jump height after different sets of barbell weighted squatting exercises, Duan Zicai found that the strength of the knee and hip extensor muscle groups was improved after strength training, and the ability to overcome the work done by gravity (body weight) was enhanced. The number of sets of repetitions per training session was not a limiting factor in the acquisition of maximal strength, provided that the magnitude of resistance (RM) and the frequency of exercises (twice a week in this study) were the same during muscle resistance exercises. As long as the exercise intensity reaches the threshold intensity, all muscle fibres are mobilised and motor nerves are exercised and adaptations are produced; whereas the number of repetitions of stimulation and excitation does not seem to be necessary for the functional enhancement of motor neurons in terms of their physiological mode of activity (Duan, 2017).

In summary, weight training is in line with the human adaptive mechanism, which enables athletes to produce a certain intensity of stimulation to the muscles while performing specialised training, and makes the muscles continuously adapt to this stimulation. In this way, the strength can be directly transformed into special strength, which is conducive to the rapid improvement of performance.

Application and effects of weight training in adolescent basketball players

For basketball, lower body explosive power is a physical quality that athletes must have. The so-called explosive force actually refers to the ability to produce maximum acceleration in the shortest possible time and thus overcome resistance. Explosive power usually consists of two components together, one is the maximum speed, and the other is the maximum force. Whether it is in the offensive phase, defensive phase, or in the starting and rebounding phases, athletes must have a certain amount of explosive power in the lower limbs. For example, in the case of two athletes with equal weight, athletes with strong lower extremity explosive force tend to perform

better in speed and jumping, so in basketball training not only need to strengthen the technical and tactical training, at the same time, also need to focus on improving the physical quality of the players.

Afonso pointed out that core stability refers to the control of the pelvic and trunk muscles, so that they are always in a stable posture during exercise, providing a fulcrum for the upper and lower limbs, effectively regulating the strength of the lower limbs, and thus making the formation and transmission of strength more effective. It should be clearly pointed out that the requirements for basketball players in various positions are different. Generally speaking, the strength of the forward player's leg strength tends to directly affect the strength and actual effect of his attack. Basketball for the physical quality of the guard has more stringent requirements (including scoring guards and organizational guards): in the running process, the knee, ankle ligaments and muscle groups need to have a strong centrifugal contraction ability; in order to achieve a rapid start, it is necessary to have a certain lower limb explosive force. Therefore, the defender should be more demanding standards to demand themselves, through intensive training to effectively eliminate their own height disadvantage, and then in time to avoid the hunting of the defenders. In the process of strength training, the training method for guard players is also suitable for other players, but explosive power and muscle strength are still the most crucial (Afonso, 2021). There are a variety of methods that can be used to improve the explosive power of the lower limbs of basketball players, but all of them need to take into account the specific characteristics of the basketball programme, so as to be practical and tailored to the needs of the students. In the training process, the coach should first carry out an in-depth and systematic study of the characteristics of basketball, and then combine the characteristics of the players to reasonably set the content of strength training. Not only to enhance the comprehensiveness and systematic training, but also need to enhance the target, in order to promote the coordinated development of the team under the premise of truly tailored to the individual, and strive to improve the effectiveness of training.

The effect of functional training on jump height in adolescent basketball players

Zhang Xiao related to a series of trainers to 16 weeks as the standard to carry out a series of functional strength skills enhancement, and further explore, its hit in the training process, the final theoretical analysis clearly indicates that, with the previous way of strength skills enhancement compared to the way to know, through the way of strength skills enhancement in the difficulty of the lower five-point jump shot hitting rate of the two groups does not have a more obvious difference between the two groups. There is no significant difference between the two groups in the lower difficulty of the five-point jump shot hitting rate, but in the relatively high difficulty of the skill training process in the jump shot hitting rate, compared to more reflect the advantages of the skills skills through the functional skills enhancement, which, to a certain extent, makes us have a new view of this. Theoretical experts have pointed out that the functional approach to strength skills improvement is more focused on athletes' deficiencies and has a certain degree of integration to improve the coordination and balance of the athlete's body (Zhang, 2013).

Xue Hai et al. launched a two-week functional strength skill enhancement for adolescent basketball players, and at the same time, it was clearly learnt that, in comparison with the previous strength skill enhancement methods, strength skill enhancement in this way can practically enhance the bouncing skills and body flexibility of this part of the trainers, promote the mastery of basketball techniques by adolescent basketball players, and enhance the stability of the technical movements of adolescent basketball players, as well as reduce the chance of basketball injury (Xue, 2015). stability, and can also reduce the chance of basketball injuries (Xue 2015).

Qi Guangyue used 16 weeks of functional training on basketball players to analyse the impact on the upper limb strength of basketball players, and the results of the study proved that the functional training means imposed on the upper limb strength in the vertical direction of the athletes can make the basketball players in the vertical direction of the upper limb strength of the upper limb in a certain degree of enhancement. The main performance of the data situation of the sitting upward push

and the players' on-court feeling are derived. Functional training related to horizontal upper body strength can improve the horizontal upper body strength of basketball players to a certain extent. This was mainly shown in the sitting solid ball passing data and the players' on-court changes. When comparing different positions among the progress, the players in the number one, two and three positions improved more than the number four and five positions. Basketball players using the same form of training and training volume to use functional training can achieve more satisfactory results (Qi, 2016)

As early as 1975, Yarnmoto introduced functional training into the military to rehabilitate injured soldiers by designing a series of unique movements to restore mobility to soldiers with joint injuries, which not only had a positive effect on the recovery of physical injuries, but also on the recovery of psychological trauma.

Mark said "the essence of sport is movement", he founded the AP Fitness Training Centre with its scientific and effective functional training system has served a number of elite sports teams and athletes around the world, and achieved brilliant results. 2012 London Olympic Games with the Chinese Olympic delegation of several sports teams, for the Chinese Olympic delegation to achieve excellent results contributed positively. 2014 Brazil World Cup helped the German team to win the title. In the 2012 London Olympic Games, the centre worked with several teams of the Chinese Olympic Delegation and contributed to the excellent results of the Chinese Olympic Delegation, and in the 2014 World Cup in Brazil, the centre helped the German team to win the championship.

From the above it can be seen that by carrying out functional strength skills to enhance the way, to a certain extent, to further strengthen the advantages of special basketball training, can be more effective in improving the physical quality of athletes, enhance the stability of athletes' technical movements, but also to reduce the chances of injury in training.

Application and effects of functional training in adolescent basketball players

In the book "Basketball First Technique Jump Shot", the author concludes through the collation and analysis of the data in the past basketball games that the jump shot technique is not only the most used offensive means in a game, but also the most relied upon means of scoring for basketball players. In addition, he also pointed out that because the jump shot is completed in the process of air to the ground, causing the shooter to be in a state of imbalance, if the shooter does not have a strong core strength as the basis, it is easy to appear the deformation of the shooting action and affect the hitting rate of the jump shot. Therefore, he believes that the upper limb and waist and abdominal strength training of basketball players should be emphasised in the strength training of athletes (Ti yu shi jie, 2009).

Qu Yanling through the "influence of basketball jump shot hitting rate of factors analysis" research and analysis that: waist and abdominal strength in the process of athletes to complete the jump shot technical action plays an important role, because the waist and abdominal position in the transmission of power plays a role in the transmission of the upper and lower limbs of the body, so that the body's upper and lower limbs of the power to closely together. Simply put, athletes have to use their lumbar and abdominal strength to effectively control the transmission of their lower limb strength in the process of jumping and throwing, and if the lumbar and abdominal strength is not good enough, it will lead to the rigidity of jumping and throwing and affect the hitting rate of the jumping and throwing (Qu, 2010).

Xu Bo, Zhang Xiaolun and Zhang Dalin believe that, from the aspect of exercise physiology, the direction of the training of bouncing qualities is mainly based on the development of lower limb strength, and the development of bouncing qualities of basketball players through the imposition of training means on the lower limbs, and at the same time, the development of corresponding training methods for the development of lower limb strength (Xu, 1998).

Literature review

Through reading the above literature analysis, it is concluded that in basketball, jumping performance is one of the most basic physical qualities, which also reflects the special qualities of young basketball players, and is also an important standard for evaluating the training methods of coaches. Strength training is an important method to improve the jumping performance, in these two methods, weight training and functional training methods both means can improve the basketball technology, but also more effective to improve the special strength. Training methods determine the effect of training, only for the sports characteristics of the project to choose training methods, so as to effectively improve the athletes' special sports ability.

CHAPTER 3
METHODOLOGY

In this study, the researchers followed the following steps

1. Study population and target groups

2.Research tools

3. Data collection

4.Data analysis

Study population and sampie groups

This paper takes the influence of weight training and functional training on the bouncing quality of adolescent male basketball players as the research object. Because the basketball beginners are limited by their own conditions of athletic ability, and to ensure the scientific and rationality of this study, the experimental subjects selected in this paper are the men's basketball team of Jiuquan Vocational and Technical College, totaling 50 people.(Purposive Sampling) G*power, power of test=0.95, alpha error=0.05,Effect size=0.85)

1.The experimental subjects were tested by jumping, the jumping data of the subjects were collected and ranked from high to low, and the top 30 were selected as the research samples.

2.According to the money 30 athletes' performance ranking order from high to low, the subjects were assigned to experimental group 1, experimental group 2, experimental group 3, in turn, 10 people in each group.

3.According to the group set up training program

3.1 Experimental group 1 is the control group, weight training

3.2 Experimental group 2 is the experimental group, functional training

3.3 Control group 3 is the reference group, without special training

Research tools

1.In-place vertical jump with hands touching high (Spec, JYJ-120cm)

2.Training Program

2.1 Weight training program

2.2 Functional Training Program

Creating Research Tools

1. Take "functional training", "adolescent", "basketball players" and "jumping performance" as the search terms. Search terms, search for relevant papers, to carefully study and analyze them, from which the research literature related to this study was selected, through the relevant research, to lay the foundation for this study, the relevant literature obtained for the theoretical basis of this paper.

2. Through and Gansu Province basketball experts and college basketball coaches and physical training experts to conduct interviews, and the development of the current situation and trend of basketball, the relevant research on the quality of bouncing, weight training and functional training and other aspects of the research were discussed.

3. The developed training program was submitted to the supervisor and the thesis steering committee to check the applicability and accuracy.

3.1 Weight training program

3.2 Functional Training Program

4. Improvement and revision of the training program after deliberation by the supervisor and the dissertation supervisory committee.

5. The improved and revised training program was used in the corresponding sample subgroups. During the experimental period, the three groups of players will not be mixed with other training contents except for technical and tactical training.

6. During the experiment, I am responsible for the training of the experimental group and formulate a perfect plan, monitor the whole process, and record and organize the data. Except for the different training methods, all other contents are the same, including the start and end time.

Data collection

1. Experiment time: 8 weeks in total

2. Both the experimental group and the control group trained for 8 weeks, training 3 times a week, specifically on Monday, Wednesday, and Friday. Each class was trained for 90 minutes, and both groups trained at the same time.

3. During the experiment, in addition to technical and tactical training, the three groups of players will not be involved in other training plans.

4. During the experiment, I was responsible for the training of the experimental group, monitoring the entire process, and recording and organizing the data. Except for the different training methods, everything else is the same, including the start time and end time.

5. The control of training load is mainly obtained by adjusting the number of training groups and the number of times each group. During the training process, the trainer's heart rate is monitored in real time.

Data analysis

In this research, the researcher analyzed the data by analyzing the scores of the vertical jump test obtained from the training as follows: The use of SPSS statistical software

1.Mean and standard deviation of the jump height of the 3 sample groups before and after training at week 4 and week 8

2.Test the difference in jump height between weight training group , functional training group and control group was analyzed by one-way analysis of variance before and after training in the week 4 and week 8 . If any differences were found, comparisons were made Pairwise comparison by Bonferroni method

3.Test the difference in jump height within weight training group , functional training group and control group by one way analysis of variance with repeated measure before and after training in the week 4 and week 8 If any differences were found, comparisons were made Pairwise comparison by Bonferroni method

4. Significance at the .05

CHAPTER 4
DATA ANALYSIS

In this study on the comparison of weight training and functional training on jumping in adolescent basketball players, the objectives were to study and compare on the muscle strength in the high jump of adolescent male basketball players as the research object. Due the experimental subjects selected in this paper are the men's basketball team of Jiuquan Vocational and Technical College, China with a total of 30 players. Before the experiment, the athletes were tested for their special muscle strength in the jump performance and divided into a weight training group a functional training group and control group, with 10 people in each group.

Data Analysis

1. Show the mean and standard deviation of age and height of all 3 groups:, Weight Training Group, Functional Training Group and Control Group

2. Show the mean and standard deviation of leg muscle strength in the high jump test of the 3 sample groups: Weight Training Group, Functional Training Group and Control Group, before training, after training in the 4 week, and after training in the 8 week.

3. The results of the analysis of variance in the repeated measures experiment to find the difference in the mean of leg muscle strength in the high jump test within the 3 sample groups before training, after training in the 4 week, and after training in the 8 week.

4. If differences are found after the analysis, use the Bonferroni pairwise difference test.

Table 1 shows the Mean ($\bar{X}$) age, weight, height of the sample group.

Sample group	Age	Weight	Height
$\bar{X}$ Control Group			
	18.00	76.60	187.30
$\bar{X}$ Weight Training			
	17.90	80.10	186.70
$\bar{X}$ Functional Training			
	18.20	75.80	187.80

Table 2 shows the Mean ($\bar{X}$) and standard deviation (S.D.) of leg muscle strength in the high jump test of the three sample groups.

Sample group	Pre- training	After 4 week of training	After 8 week of training
Control Group			
$\bar{X}$	2.87	2.88	2.98
S.D.	.06	.06	.08
Weight Training			
$\bar{X}$	2.85	2.94	3.07
S.D.	.06	.07	.07
Functional Training			
$\bar{X}$	2.86	2.91	3.02
S.D.	.06	.06	.08

Table 2 the basic statistics of muscle strength in the high jump test of the 3 sample groups are as follows:

Control Group before training had a mean of 2.87 cm, standard deviation of .06 cm, the mean of 2.88 cm, standard deviation of .06 cm, and the mean of 2.98 cm, standard deviation of .08 cm at week 4 of training, and the mean of 2.98 cm, standard deviation of .08 cm at week 8 of training.

Weight Training Group before training had a mean of 2.85 cm, standard deviation of .06 cm, the mean of 2.94 cm, standard deviation of .07 cm, and the mean of 3.07 cm, standard deviation of .07 cm at week 8 of training.

Functional Training Group before training had a mean of 2.86 cm, standard deviation of .06 cm, the mean of 2.91 cm, standard deviation of .06 cm, and the mean of 3.02 cm, standard deviation of .08 cm at week 8 of training.

Table 3 One-way ANOVA results of leg muscle strength in the high jump test of the three sample groups before training.

Source of variance	SS	df	MS	F	P
Pre- training					
Between groups	.00	2	.00	.21	.81
	.11	27	.00		
Within groups					
Total	.11	29			

Statistically significant at .05

Table 3 shows that the results of the one-way analysis of variance of leg muscle strength in the high jump test before training in all 3 groups found that before training, leg muscle strength from the high jump test was not statistically significant at the .05.

This shows that leg muscle strength from the high jump test of the 3 sample groups before training had similar leg muscle strength from the high jump test, with the same effect as after training in the 4 week and after training in the 8 week Training and the ability of the 3 sample groups had similar leg muscle strength from the high jump test.

Table 4 One-way ANOVA results of leg muscle strength in the high jump test of the three sample groups after the 4 week of training.

Source of variance	SS	df	MS	F	P
After 4 week of training					
Between groups	.02	2	.01	2.54	.09
Within groups	.10	27	.00		
Total	.12	29			

Statistically significant at the .05

Table 4 shows that the results of the one-way analysis of variance of leg muscle strength in the high jump test after the 4 week of training in all 3 groups found that after the 4 week of training, the leg muscle strength was not statistically significant at the .05.

This shows that the leg muscle strength from the high jump test of the 3 sample groups for the period after the 4 week of training had leg muscle strength from the high jump test that was similar, with the same effect as before the training. And after the 8 week of training, the training and ability of the 3 sample groups had leg muscle strength from the high jump test that was similar.

Table 5 One-way ANOVA results of leg muscle strength in the high jump test of the three sample groups after the 8 week of training.

Source of variance	SS	df	MS	F	P
After 8 week of training					
Between groups	.03	2	.01	3.37	.04
Within groups	.15	27	.00		
Total	.19	29			

Statistically significant at .05

Table 5 shows that the results of the one-way ANOVA of leg muscle strength in the high jump test after the 8 week of training in all 3 groups found that after the 8 week of training, the leg muscle strength in the high jump test was significantly different at the .05

This shows that any training period had an effect on the jump height differently from any other period.

Table 6 Pairwise comparison results of leg muscle strength in the high jump test after the 4 week of training.

Pairwise comparison	Control Group	Weight Training	Functional Training
Control Group	-	1.00	1.00
Weight Training		-	1.00
Functional Training		-	

Statistically significant at .05

Table 6 The results of pairwise comparisons of the three groups in the leg muscle strength test in the high jump test before training showed that the three groups were not significantly different before training at the .05

Table 7 Pairwise comparison results of leg muscle strength in the high jump test after the 4 week of training.

Pairwise comparison	Control Group	Weight Training	Functional Training
Control Group	-	.15	1.00
Weight Training		-	.23
Functional Training		-	

Statistically significant at .05

Table 7 The results of pairwise comparisons of the three groups in the leg muscle strength test in the high jump test after the 4 week of training showed that after the 4 week of training, the 3 groups were not significantly different at the .05

Table 8 Pairwise comparison results of leg muscle strength in the high jump test after the 8 week of training.

Pairwise comparison	Control Group	Weight Training	Functional Training
Control Group	-	.04	.69
Weight Training		-	.23
Functional Training		-	

Statistically significant at .05

Table 8 The results of pairwise comparisons of the 3 groups in the leg muscle strength test in the high jump test after the 8 week of training showed that the Control Group and the Weight Training group were significantly different at the .05 , but the Control Group and Functional Training and the Weight Training and Functional Training groups were not significantly different at the .05

CHAPTER 5
RESULT AND DISCUSSION

Objectives

1.Study of the effects of weight training and functional training on the jumping of adolescent basketball players.

2.Compare the effects of weight training and functional training on the jumping of adolescent basketball players.

Sample of the study

The experimental subjects selected in this paper are the men's basketball team of Jiuquan Vocational and Technical College, with a total of 50 people. The experimental subjects collected the jumping data of the subjects through a jump test, and arranged them from high to low, and selected the top 30 as the research sample. According to the ranking order of the scores of the top 30 athletes, the subjects were assigned to experimental group 1, experimental group 2, and experimental group 3 in order from high to low, with 10 people in each group. The training plan was set according to the grouping. Experimental group 1 was the control group, which performed weight training; experimental group 2 was the experimental group, which performed functional training; experimental group 3 was the reference group, and no special training content was set.

Research tool

1. Jump vertically on the spot and reach high with both hands
2. Training Program
    2.1 Strength Training Program
    2.2 Functional Training Program

Results and Discussion

Results

1.The basic statistics of muscle strength in the high jump test of the 3 sample groups are as follows:

Control Group before training had a mean of 2.87 cm, standard deviation of .06 cm, the mean of 2.88 cm, standard deviation of .06 cm, and the mean of 2.98 cm, standard deviation of .08 cm at week 4 of training, and the mean of 2.98 cm, standard deviation of .08 cm at week 8 of training.

Weight Training Group before training had a mean of 2.85 cm, standard deviation of .06 cm, the mean of 2.94 cm, standard deviation of .07 cm, and the mean of 3.07 cm, standard deviation of .07 cm at week 8 of training.

Functional Training Group before training had a mean of 2.86 cm, standard deviation of .06 cm, the mean of 2.91 cm, standard deviation of .06 cm, and the mean of 3.02 cm, standard deviation of .08 cm at week 8 of training.

2. The results of the one-way analysis of variance of leg muscle strength in the high jump test before training in all 3 groups found that before training, leg muscle strength from the high jump test was not statistically significant at the .05.

This shows that leg muscle strength from the high jump test of the 3 sample groups before training had similar leg muscle strength from the high jump test, with the same effect as after training in the 4 week and after training in the 8 week Training and the ability of the 3 sample groups had similar leg muscle strength from the high jump test.

3. The results of the one-way analysis of variance of leg muscle strength in the high jump test after the 4 week of training in all 3 groups found that after the 4 week of training, the leg muscle strength was not statistically significant at the .05.

This shows that the leg muscle strength from the high jump test of the 3 sample groups for the period after the 4 week of training had leg muscle strength from the high jump test that was similar, with the same effect as before the training. And after the 8 week of training, the training and ability of the 3 sample groups had leg muscle strength from the high jump test that was similar.

4. The results of the one-way ANOVA of leg muscle strength in the high jump test after the 8 week of training in all 3 groups found that after the 8 week of training, the leg muscle strength in the high jump test was significantly different at the .05

This shows that any training period had an effect on the jump height differently from any other period.

5. The results of pairwise comparisons of the three groups in the leg muscle strength test in the high jump test before training showed that the three groups were not significantly different before training at the .05

6. The results of pairwise comparisons of the three groups in the leg muscle strength test in the high jump test after the 4 week of training showed that after the 4 week of training, the 3 groups were not significantly different at the .05

7. The results of pairwise comparisons of the 3 groups in the leg muscle strength test in the high jump test after the 8 week of training showed that the Control Group and the Weight Training group were significantly different at the .05 , but the Control Group and Functional Training and the Weight Training and Functional Training groups were not significantly different at the .05

Discussion

This study investigated the effects of functional training and weight training on the jumping performance of adolescent basketball players over an 8-week schedule. After the 4th and 8th weeks of training, we measured the athletes' jumping performance, and then analyzed the results statistically to discuss the results.

1. After 8 weeks of group training, the comparison and analysis of the experimental data of the two groups proved that functional training can significantly improve the jumping performance of adolecent basketball players. Therefore, although weight- training is also a good training method, from the perspective of comprehensive and coordinated development of basketball-specific jumping performance, the integration of functional strength and strength will be more helpful to enhance the jumping performance of athletes in situ. Weight-bearing training is a kind of training that

increases the load when the body is in a stable state, mainly targeting the large muscle groups of the body, including the upper and lower limbs and the waist and abdomen. Through the stimulation of appropriate load, the number of muscle fibers and the cross-sectional area of the muscles are increased, so that the strength, speed, endurance, etc. of the muscles are improved (Zhou, 2018).

2. After 8 weeks of group training, the comparison and analysis of the two groups of experimental data proved that functional training can significantly improve the jumping performance of adolescent basketball players. It can be seen that the use of functional training can more effectively improve the special jumping performance level of high school male basketball players than strength. Functional training is a new type of competitive sports training method. It is to apply some training methods and means that are often used in the fields of fitness and rehabilitation to improve the stability of the spine in the training process of athletes. This plays a vital role in improving the competitive ability of athletes, preventing injuries to athletes, and accelerating the recovery process of fatigue.

3. After 8 weeks of group training, the comparison and analysis of the experimental data of the two groups proved that functional training and weight training did not significantly improve the continuous jumping performance basketball players. This shows that in the process of taking off speed, jumping endurance and whole body coordinated force, both functional strength and traditional strength training play an extremely important role. "Jumping performance" is also called "Jumping performance" or "jumping power", which refers to the force that enables the human body to jump quickly into the air through the coordinated force of the lower limbs and the whole body. Jumping power is a comprehensive quality. When training, it is necessary to grasp the important factors of strength, speed and coordination, and combine it with technical training (Sun, 2004).

Suggestion

1. It is hoped that in the future, when training the jumping performance of adolecent basketball players, functional training methods and means can be applied to athletes based on strength, and the two strength training methods can be combined for training. It is also hoped that future scholars can study the effects of functional training on other aspects of the physical quality of high school male basketball players.

2. According to the actual conditions of the school, the selection of training equipment must be strictly screened. Functional training method is a training method with high requirements for equipment, so it must not be replaced by general equipment. It is hoped that the majority of coaches will apply to the school to purchase more training equipment when implementing functional training for athletes.

3. When conducting functional training for athletes, coaches must be strict with the athletes' movements, and pay attention to controlling muscles through nerves to ensure the quality of the movements during the completion of the movements. When formulating training plans, it is necessary to combine special projects, and in the later stages of training, advanced exercises of training methods can be added to further enhance the stability of athletes.

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APPENDIX

APPENDIX A

Weight training program

Weight training program

cycle	Training content	Training time	Training sets	Number per set	Training load	Interval between groups (S)
1-4	Basketball project special training	45′	Dribbling, passing, shooting, defensive tactics, offensive tactics special training			
	Squat Deep jump	35′	6	8	Own weight *60%	120
	Full Squat		6	8	Own weight *60%	90
	Half Squat		4	10	10RM	90
	Leg raises		6	30	Own weight *60%	90
	Deep jump		4	10	40-80KG	90
	Hanging leg raise		6	15	Own weight *60%	90
	Barbell front Lunges		4	10	Own weight *60%	90

	Reverse Crunch		6	30	Own weight *60%	90
	Deadlift		4	10	10RM	90
	Stretch (Toe Touch)	10′	Stretch the join, hip flexors, hamstrings of the thigh, hamstrings of the calf, gluteus maximus and other muscle groups			
5-8	Basketball training	45′	Dribbling, passing, shooting, defensive tactics, offensive tactics special training			
	Squat Deep jump	35′	6	8	Own weight *100%	120
	Full Squat		6	8	Own weight *100%	90
	Half Squat		4	10	15RM	90
	Leg raises		6	30	Own weight *100%	90
	Deep jump r		4	10	60-100KG	90
	Hanging leg raise		6	15	Own weight *100%	90

	Barbell front Lunges		4	10	Own weight *100%	90
	Reverse Crunch		6	30	Own weight *100%	90
	Deadlift		4	10	15RM	90
	Stretch (Toe Touch)	10	Stretch the groin, hip flexors, hamstrings of the thigh, hamstrings of the calf, gluteus maximus and other muscle groups			

APPENDIX B

Functional training program

Functional training program

cycle	Training content	Training time	Training sets	Number per set	Training load	Interval between groups (S)

1-4	Basketball project special training	45′	Dribbling, passing, shooting, defensive tactics, offensive tactics special training			
	Elastic band lunge rotation	35′	6	16	Resistance level (heavy)	60
	Kettlebell squat		6	12	16KG	90
	Kettlebell balance plate squat		6	12	16KG	90
	Supine hip lift		6	20	Own weight *60%	90
	Elastic band one leg upright lift (with balance plate)		6	15	Resistance level (heavy)	90
	Balance disc kettlebell Romanian deadlift		6	12	16KG	90
	Prone lying ball leg curl		6	20	Own weight *60%	90
	Supine ball leg raise		6	20	Own weight *60%	90
	Side jump		6	20	Own weight	90
	Stretch (Toe Touch)	10′	Stretch the groin, hip flexors, hamstrings of the thigh, hamstrings of the calf, gluteus maximus and other muscle groups			

5-8	Basketball project special training	45′	Dribbling, passing, shooting, defensive tactics, offensive tactics special training			
	Elastic band lunge rotation	35′	6	16	Resistance level (heavy)	60
	Kettlebell squat		6	12	32KG	90
	Kettlebell balance plate squat		6	12	32KG	90
	Supine hip lift		6	20	Own weight *100%	90
	Elastic band one leg upright lift (with balance plate)		6	15	Resistance level (heavy)	90
	Balance disc kettlebell Romanian deadlift		6	12	32KG	90
	Prone lying ball leg curl		6	20	Own weight *100%	90
	Supine ball leg raise		6	20	Own weight *100%	90
	Side jump		6	20	Own weight	90
	Stretch (Toe Touch)	10′	Stretch the groin, hip flexors, hamstrings of the thigh, hamstrings of the calf, gluteus maximus and other muscle groups			

APPENDIX C

Approval form for Ethical Review of Research Experiments

Approval Form for Ethical Review of Research Experiments

Project Title	Comparing of weight training and functional training on jumping performance in adolescent basketball players		
Project source	not have		
Project Leader	Cui Jin Zhong	College	Faculty of Physical Education and Health
Review category	☐Apply for animal experimentation ☐Declaration of scientific research projects ☑Other		

(The main research content and the ethical experimental program involved, including the purpose of animal experiments, experimental methods, observation indexes, and methods of disposing of animals after the experiments)

Overview:: The effects of weight training and functional strength training methods on the jumping qualities of youth basketball players were studied to provide practical training methods for youth basketball coaches.

Erhical Target: 30 members of the basketball team of Jiuquan Vocational and Technical College

Experimental Protocol: Prior to the start of the experiment, the selected subjects participated voluntarily, understood the experimental process, ensured that they were fully informed and respected their wishes; inquired about and investigated the health status of the subjects, and ascertained that the subjects were psychologically healthy. All subjects were not threatened, coerced, or induced in any way, and the grouping of subjects was objective and randomized. The applicant and the researchers have accumulated rich experimental experience, and will strictly protect personal privacy and prevent the disclosure of relevant information.

Applicant (project leader) commitment:

The above information is true. If approved, I will conduct research in strict accordance with the provided program, abide by the ethical code of scientific research and experiment and relevant regulations, and voluntarily accept the supervision and inspection of the academic committee of the university. If I violate the regulations, I will voluntarily accept the corresponding punishment.

Signature of applicant (project leader): Cui Jin Zhong Date: 2024.8.13

Faculty Academic Council review comments:

After review by the Academic Committee of the School of Physical Education, the design specifications, research content and process of the project are in line with the ethical requirements of scientific research experiments promulgated by the state, and it is agreed that the project will be implemented as planned.

Academic Council of the Facult

Date: 2024.8.13

University Academic Council review comments:

1. Applicant qualification: ☑meet the requirements ☐do not meet the requments
2. Experimental program: ☑Appropriate ☐Inappropriate
3. Conclusion of the review: ☑Agree ☐Discuss after modifition ☐Disagree

Academic Committee of College

Date: 2024.8.13

学术委员会

APPENDIX D

Test and training process data

High jump standing test

Objective:

To test leg muscle strength and arm, eye, and muscle coordination.

How:

1. The tester stands vertically and touches the position as high as possible by jumping in place, and records the instrument display data.

2. Perform the test at least 3 times and record the score in centimeters, the value can be rounded up to an integer, but not more than half a centimeter.

Note:

1. You are not allowed to jump twice in a row or move your feet before jumping.

2. The jump height must be the highest point that the tester can complete.

3. Both feet must touch the ground at the same time when jumping.

4. If the tester practices before the test, test confidence and score will be improved.

Training process data

Training program: Weight training

Action Name:Squat Deep jump

Training objective: to develop the explosive power of lower limbs and improve the ability of quick jumping


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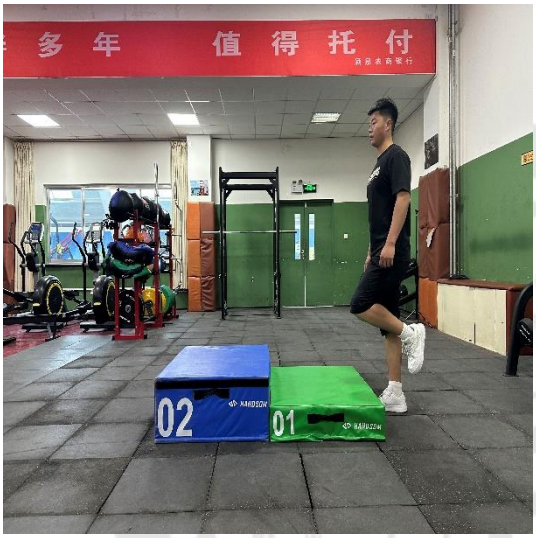
Training program: Weight training

Action Name:Full Squat

Training goal: To strengthen legs and ankles



Training program: Weight training

Action Name:Half Squat

Training objective: to enhance the absolute strength of the leg muscle group and improve the control ability of the waist and abdomen

Training program: Weight training

Action Name:Leg raises

Training goals: Develop strength in gluteus maximus, front thigh muscles and posterior femoris muscles

Training program: Weight training

Action Name:Deep jump

Training goals: Strengthen biceps, quadriceps and abdominal muscles

Training program: Weight training

Action Name:Hanging leg raise

Training objective: To enhance the strength of rectus abdominis and its upper limb muscles

Training program: Weight training

Action Name:Barbell front Lunges

Training objective: To enhance the explosive power of quadriceps and gluteus maximus

Training program: Weight training

Action Name:Reverse Crunch

Training goal: To strengthen the muscles of the waist and hip

Training program: Weight training

Action Name:Reverse Crunch

Training goals: Strengthen the buttocks, erector spinals and quadriceps

Training program: Weight training

Action Name: Whole body stretch

Training goals: Increase joint range of motion, reduce the risk of injury, improve the flexibility of the body, and speed up the recovery of physical function

Training process data

Training program: Functional training program

Action Name: Elastic band lunge rotation

Training goals: It mainly develops the strength of gluteus maximus, thigh front muscle group and femoris posterior muscle group

Training program: Functional training program

Action Name: Kettlebell squat

Training goals: Develops strength in the gluteus maximus, quadriceps, and posterior femoris muscles, as well as flexibility in the gluteus maximus

Training program: Functional training program

Action Name: Kettlebell balance plate squat

Training goals: It mainly develops the strength of the gluteus maximus, the front of the thigh, and the femoris posterior muscles, as well as body stability

Training program: Functional training program

Action Name: Supine hip lift

Training goals: It mainly develops the strength of the hip flexor muscles

Training program: Functional training program

Action Name: Elastic band one leg upright lift (with balance plate)

Training goals: To develop hip flexor strength and body stability

Training program: Functional training program

Action Name: Balance disc kettlebell Romanian deadlift

Training goals: It mainly develops the strength of the femoris posterior muscle group, the buttock muscle group and the body stability

Training program: Functional training program

Action Name: Prone lying ball leg curl

Training goals: It mainly develops the explosive power of the hips, the strength of the legs to push off the ground, and the ability to coordinate the whole body and the strength of the body control

Training program: Functional training program

Action Name: Supine ball leg raise

Training goals: It mainly develops the strength of the femoral posterior muscle group, the hip muscle group and the core of the body

Training program: Functional training program

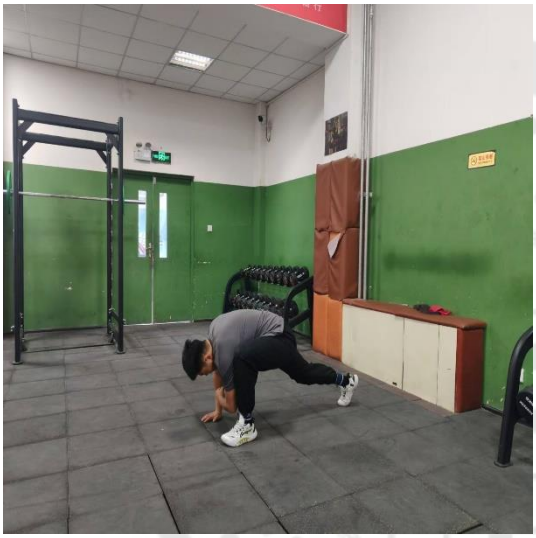
Action Name: Side jump

Training goals: Improve continuous explosive power in both legs

Training program: Functional training program

Action Name: Whole body stretch

Training goals: Increase joint range of motion, reduce the risk of injury, improve the flexibility of the body, and speed up the recovery of physical function



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