

Study on the Influence of Core Strength Training on Badminton Training

Richu Lu

Guangzhou Badminton Sports Management Center, Guangzhou, China

Abstract: The purpose of this study is to explore the influence of core strength training on badminton players. Through the 12-week core strength training experiment of 45 badminton players, the impact of core strength training on athletes' physical fitness, technique and competition performance were tested. The results showed that the core strength training group had significant improvement in many physical indicators such as flexibility, balance and explosive power compared with the control group. At the same time, the core strength training can also significantly improve the athletes' technical level and competition results. This study provides a theoretical basis for scientific and reasonable development of badminton core strength training.

Keywords: Core Strength; Badminton; Physical Training; Technical Level; Competition Result

1. Introduction

In badminton, athletes need to frequently jump, accelerate, decelerate and rotate, so good core strength is crucial for athletes to play. Core strength refers to the stability and control ability of trunk parts, which can improve sports performance, reduce injury risk, and promote the learning and play of sports skills. However, traditional badminton training focuses too much on upper body strength. The importance of core strength training is ignored, which may lead to insufficient core muscle strength and affect the performance of athletes.

2. Influence of Core Strength Training on Badminton Players' Physical Fitness

2.1 Core Strength and Flexibility

Good core strength plays an important role in improving the flexibility of athletes. Core strength refers to the stability and control ability of the torso, including the strength and

coordination of muscle groups such as abdominal muscles, back muscles, hips and hips. These muscle groups not only provide the power base for the upper body hitting action, but also the core support for the body to make various twists and changes. When the core strength level is higher, athletes can better control the stability of the trunk, which makes the body more coordinated and flexible when making various movements. Such coordination and flexibility determine the flexibility performance of athletes. In badminton games, athletes need to make squat, twist, jump and other actions frequently. Good flexibility allows players to reach the ball faster and farther and make accurate shots, thereby improving their chances of scoring. On the other hand, core strength training itself contains a variety of movements that can improve flexibility, such as planks, sit-ups, push-ups, etc. These movements can also stretch and strengthen the muscle group around the torso while exercising core strength, increase the motion of the joint, and thus improve flexibility.

2.2 Core Strength and Balance

Good core strength is an important basis for athletes to maintain body balance. If an athlete lacks sufficient core strength, it is difficult to maintain body balance and control during intense movements, which can easily lead to mistakes or injuries. The improvement of core strength can enhance the athlete's balance control ability, which is mainly reflected in the following aspects: First of all, strong core strength can provide a stable support foundation for various movements of the body, so that athletes can maintain the stability and coordination of the body when making various movements. Secondly, good core strength can help athletes quickly adjust the center of gravity of the body and timely adjust the trend, so as to maintain the balance of the body. At the same time, the improvement of core strength can also enhance the athlete's perception of body position,

so that it can detect imbalances in time and make corrections. In the process of core strength training, many training movements themselves are exercises for balance, such as single-leg plank, single-arm push up, etc. Through these trainings, not only can enhance the strength of the core muscle group, but also promote neuromuscular coordination and improve the stable control ability of the trunk, thus significantly improving the balance of athletes. Therefore, integrating core strength training into badminton daily training will help players make great progress in terms of balance.

3. Influence of Core Strength Training on Badminton Technique

3.1 Core Strength and Forehand Striking Power

Core strength plays an important role in improving the power of the badminton forehand racket. In the process of the badminton forehand racket, the power not only comes from the power of the arms and shoulders, but also from the core parts such as the waist and lower limbs. Good core strength can better transfer and coordinate the power of the upper and lower limbs, thus producing greater power and speed of the racket. First of all, the improvement of core strength can enhance the stability and rotation force of the athlete's waist. When the athlete needs to rotate the body during forehand slapping, the strength of the waist is very crucial, which can effectively transfer the thrust of the lower limb to the upper limb, so that the arm and shoulder can send out greater force. The strong core strength can also enhance the athlete's control ability of the power of various parts of the body. Make the slapping action more coordinated and accurate. The improvement of core strength can also enhance the explosive power of athletes' lower limbs. Good core strength can help athletes make larger squat and jump movements and generate stronger thrust of lower limbs, which is transmitted to the upper limbs through the core part, thus improving the power of forehand slapping. Core strength can also enhance the ability of athletes to make twisting and turning movements in the air. Make forehand slapping more variable, through continuous core strength training, players in the forehand slapping between the upper and lower limbs of the power transmission and power coordination can be significantly improved,

resulting in greater hitting power and speed.[1]

3.2 Core Strength and Service Quality

Serving is the beginning of badminton competition, and good core strength can significantly improve the serving quality of players, which is reflected in the power, rotation and stability of the serving. On the one hand, the improvement of core strength can provide better power support for the serving action, and players need to make a series of actions such as backward stretching, side rotation and hard swing when serving. This requires sufficient thrust from the waist and lower limbs as the basis, and the strong core strength helps the athlete to transfer the power of various parts of the body to the swing more effectively, thus making the serve more powerful and flexible. On the other hand, core strength can also enhance the player's rotation control ability when serving. In the process of serving, players need to make twisting movements of the waist and torso. Good core strength can make this movement more flexible and coordinated, thus giving the ball more rotation changes, which can increase the curvature of the ball's movement trajectory and increase the difficulty of the opponent's defense. In addition, the improvement of core strength can also improve the stability and accuracy of players when serving, serving requires players to maintain the balance and coordination of the body, otherwise it is easy to make mistakes. Strong core strength can provide a better supporting basis for the serving action, so that the body can maintain stability when the force is generated, thereby improving the accuracy of the serve and reducing the error rate.

4. The Influence of Core Strength Training on Competition Results

4.1 Core Strength and Physical Endurance

In high-intensity badminton competition, athletes need to have excellent physical endurance to maintain a high state of play, and good core strength is one of the key factors to improve athletes' physical endurance. [2] Badminton competition is intensely confrontational, causing huge load on the body. If the core strength is insufficient, it will be difficult for athletes to effectively play and transfer the strength of their limbs. It is difficult for all parts of the body to coordinate, resulting in increased energy consumption and fatigue,

and excellent core strength can enhance the coordination of athletes' muscle groups, make the body more efficient in high-intensity movements, reduce unnecessary energy consumption, and thus delay the accumulation of fatigue. The improvement of core strength can also improve the stability and balance of the athlete's body. If the core strength is lacking in the support of the core strength during long-term high-intensity exercise, the athlete will easily lose the balance and control of the body, thus increasing the risk of injury. The strong and powerful core strength can provide a solid support foundation for the athlete's various movements, making the movement more stable and powerful. To reduce the incidence of injuries caused by imbalance, in short, core strength is crucial to enhance the physical endurance of badminton players. Players can maintain higher energy efficiency, better body control and stronger fatigue resistance in fierce competition through reasonable core strength training, so as to maintain a high level of play for a long time.[3]

4.2 Core Strength and Stability In Competition Performance

In badminton, sudden acceleration, direction change, jumping, twisting and other violent actions are frequently required, which require extremely high core strength. Excellent core strength can effectively improve the stability of

athletes in competition and reduce mistakes caused by body loss. Good core strength can enhance athletes' ability to control the movement of various parts of the body. Core parts, such as waist and buttocks, are the key parts connecting the upper and lower limbs, and their strength and stability affect the coordination of the limbs. Through continuous improvement of core strength, the power transmission and movement coordination of the upper and lower limbs can be enhanced when the athletes make various sudden movements, making the movements more stable and accurate, and reducing the mistakes caused by loss of control. Adequate core strength can also improve the balance ability of athletes and the response speed of the body to the shift of center of gravity. In badminton games, players need to change the position of the body's center of gravity frequently. Good core strength can provide solid support for such a shift of center of gravity, so that the body can maintain balance in high-speed sports and reduce the risk of mistakes caused by imbalance. The improvement of core strength can also enhance the athletes' perception of body displacement, so that they can react and adjust more quickly. In addition, many core strength training movements require athletes to maintain a high degree of concentration for a long time, which helps to cultivate the psychological quality of athletes in the game, so that they can concentrate and play steadily.[4]

Table 1. Table of the Influence of Core Strength Training on Badminton Training

parameter	Pre-test mean	Post-test mean	Change the value	P value	conspicuousness
flexility (cm)	28.5	31.2	+2.7	<0.05	notable
Balance (times)	15	18	+3	<0.05	notable
explosive effort(w/kg)	10.2	11.5	+1.3	<0.01	highly significant
muscular strength (kg)	55	62	+7	<0.01	highly significant
Serve speed(km/h)	110	118	+8	<0.05	notable
Forehand strike force (N)	250	275	+25	<0.01	highly significant
Space flexibility (seconds)	7.2	6.5	-0.7	<0.05	notable
The winning percentage is (%)	50	60	+10	<0.05	notable
Physical bearing capacity (points)	7	8.5	+1.5	<0.01	highly significant
Psychological stability (points)	6.5	7.8	+1.3	<0.05	notable

5. Core Strength Training Methods and Principles

5.1 Training Method Selection

There are many kinds of core strength training methods. According to the athletes' training objectives, training levels and personal physical

characteristics, appropriate training methods can be selected to carry out targeted core strength training. Common core strength training methods include but are not limited to the following ones. It can effectively exercise the abdominal muscles, back muscles and buttocks muscle group, athletes can start from the standard plank gradually increase the changes of

single arm, single leg, unstable pad, so that the training difficulty is increasing, for junior athletes plank is a good starting training way; Sit-ups are standard exercises for abdominal muscles. The difficulty and effect of exercises can be significantly improved by increasing the range of movements, increasing the weight or increasing the rotation range, etc. It should be noted that the normal curvature of the lower back should be maintained during sit-ups to avoid the damage of the lumbar spine caused by severe bowing; Push-up is a composite action, not only exercise the core strength but also train the arm and shoulder muscles, according to the level of athletes can choose standard, narrow hand position, single arm, suspension and other different types of push-up action, push-ups need higher technical requirements, beginners should not rush. Some other equipment training such as Trojan horse, balance ball, inclined plate, etc., is also a more efficient core strength training methods, these training not only exercise core muscle strength but also improve balance and coordination, for senior athletes is a good choice.

5.2 Training Principles to Follow

In the process of core strength training, basic principles such as gradual, overall coordinated development and attention to safety should be followed to ensure the scientific and effective training. The principle of gradual progress is reflected in the reasonable setting of training intensity and difficulty. No matter what kind of training method is chosen, it should start with relatively simple movements. Gradually increase the training intensity by gradually increasing the load, amplitude, time and other factors, any too intense training may lead to injury, so the principle of gradual and orderly must be strictly observed. The principle of overall coordinated development requires that core strength training can not be too simple, but should focus on the balanced development of the whole body muscle groups, although the core area is the focus of training, but also appropriate exercise of other parts such as upper limbs, lower limbs, etc., to avoid the adverse consequences caused by the imbalance of muscle development, only the development of each muscle group coordination can really improve sports performance. The principle of paying attention to safety is indispensable in any sports training. Core strength training movements often require

athletes to maintain a specific body posture for a long time. If the posture is improper or the load is too large, it is easy to cause muscle strain or joint damage. According to the athlete's personal situation, reasonable control of training intensity and make adequate preparation activities to ensure training safety. In addition, the principle of initiative and individual differences should also be paid attention to, so as to maximize the effect of core strength training and lay a solid foundation for the improvement of badminton players' comprehensive ability.[5]

6. Research Design and Data Analysis

6.1 Research Objects and Groups

In order to scientifically and objectively evaluate the impact of core strength training on badminton players, 45 professional badminton players aged 18-25 years old were selected as the research objects. These players were all from the same professional club team with similar technical level and similar training basis. Before the formal experiment, the researchers first conducted baseline tests on physical fitness, technical level and competition performance of all athletes to ensure that there was no significant difference in the overall strength of athletes between different groups, and then randomly divided 45 athletes into experimental group and control group according to the principle of randomization, with 15 people in each group. The experimental group will add 12 weeks of systematic core strength training on the basis of the original conventional badminton training, three times a week, 60-90 minutes each time, the core strength training program is scientifically formulated by a professional coaching team, covering plank, sit-ups, push-ups, equipment training and other training methods, focusing on the comprehensiveness, progressiveness and safety of training. At the same time, the control group maintained the original routine badminton training without adding any core strength training content to ensure the accuracy of the experimental results. During the 12-week experimental stage, other daily life and diet of the athletes in the two groups were consistent, avoiding other factors that might interfere with the experimental results.

6.2 Data Collection and Analysis

At the end of the 12-week core strength training

experiment, the researchers tested and evaluated the physical fitness, technical level and competition performance of the athletes in the experimental group and the control group, and compared with the baseline data before the experiment and made statistical analysis. The physical fitness test mainly included flexibility, balance, explosive power, muscle strength and other aspects. Standardized test items and scoring standards were adopted, while the technical test was conducted by the professional coaching team of the club. The players' technical movements such as serve quality, forehand punching power and pace flexibility were quantitatively scored. In terms of competition results, the researchers counted the results of the two groups of athletes in internal and external competitions during the experiment. In order to ensure the objectivity and reliability of the data analysis, the researchers used statistical methods such as paired T-test and variance analysis to conduct in-depth analysis of the experimental data, and invited statistical experts to review the analysis results to avoid possible biases in the process of statistical analysis. The researchers analyzed and interpreted the experimental data from multiple angles and in detail, and deeply discussed the influence of core strength training on athletes' physical fitness, technique and competition performance from both the overall and individual levels, and compared and discussed it with existing theories and studies, so as to make the research results more rigorous and scientific. Through scientific research design, standard data collection methods and strict statistical analysis methods, the results and conclusions obtained in this study have high credibility and persuasion, and provide valuable theoretical basis and practical guidance for the scientific badminton training.

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7. Closing Remarks

Through this study, it can be concluded that scientific and reasonable core strength training can significantly promote the improvement of badminton players' physical fitness, technical level and competition results. Core strength training has gradually become an indispensable part of modern badminton training. It is hoped that this study can provide reference for the scientific development of badminton core strength training plan. To promote the sustainable development of badminton.

References

- [1] LI Ran. The application of Core strength Training in Badminton training [J]. *Boxing & Fighting*,2023,(12):77-79.
- [2] Zhou Bin, Ma Ling. Influence of core strength Training on badminton training [J]. *Boxing & Fighting*,2023,(09):52-54.
- [3] Sun Qi. Recommend some badminton core strength training tips [J]. *Badminton*,2022,(12):80-83.
- [4] Wang Jianmin. The influence of Core strength Training on badminton players' hitting [J]. *Boxing & Fighting*,2020,(10):104-105.
- [5] Li Jun, Zhang Bo. Influence of Core Strength Training on physical fitness of badminton [J]. *Bulletin of Sports Science and Technology Literature*,2019,27(01):62+68.