



Developing A Core Strength Training Program to Improve Badminton High Clear Stroke for University Students

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Abstract

Background and Aims: With the continuous development of badminton, international competitions have become increasingly confrontational and competitive, which places higher demands on athletes' physical fitness and technology. Therefore, the purpose of this study is to add core strength training and traditional strength training to badminton high clear stroke skill training, compare the test results after training, and find a more effective strength training method to improve badminton high clear stroke skill.

Materials and Methods: This study took 40 students (20 boys and 20 girls) out of 230 students (20 boys and 20 girls) in the 2022 special badminton class of Guangxi Medical University. This study introduces the test standard of badminton high clear stroke technology, focusing on the theory of badminton strength training. Through interviews with 5 experts, the high clear stroke technical test standards, physical fitness test standards, and training plans were determined (IOC test result is 0.925 ± 0.1438). The training experiment lasted 8 weeks.

Results: (1) Compared with traditional strength training, core strength training can improve students' physical fitness. (2) Core strength training has a more significant effect on improving badminton high clear stroke skills than traditional strength training.

Conclusion: The core muscle strength exercise added to the badminton training program was created by the researcher and validated with 5 experts by IOC technique the IOC was 0.925 ± 0.1438 . The Program was confirmed by the execution of a group pretest and posttest experimental design The subject was 40 students who tested with a high clear stroke test, then took the score to rank the subjects descending and sampling with systematic method into 2 groups. The experiment operated for 8 weeks, 2 sessions a week, and 2 hours a session. Collect high clear stroke test and fitness test scores after the last class.

Keywords: University Students; Badminton High Clear Strokes; Core Muscle Strength; Traditional Strength Training

Introduction

As an important item in sports, badminton integrates competitive value, entertainment value, and fitness value. Badminton has very high requirements for the physical fitness of athletes, and a lot of strength training is needed to enhance the physical fitness of athletes. Badminton requires athletes to have fast athletic ability and a strong physical foundation. Based on strengthening physical fitness and fast movement ability, the "stable, accurate and fast" serving and receiving of the ball can be realized (Chen, X.M., 2020). Badminton is a sport that requires high speed and quality for students. Whether it is the reaction speed, movement speed, or displacement speed of students, there is a close relationship with the students' badminton sports level. The value of strength quality to college badminton cannot be ignored. Badminton has high requirements for the strength of the upper and lower limbs of the participants, so it is essential to train students in general strength and special strength in teaching activities (Zhang, J., 2020). Badminton technology is divided into front-court technology and back-court technology. Forehand high clear stroke technology belongs to back-court technology and is the basis of all badminton technologies (Tong, C., 2018). Therefore, how to quickly improve students' badminton high clear stroke skills in daily training has become an important topic for teachers.

Badminton is more sensitive than other sports. During daily competition and training, the lower limbs of athletes need to perform kicking and jumping movements for a long time, and the upper limbs cooperate with the lower limbs to perform serving and hitting movements at the same time. As the main pillar of the human body, the torso needs to coordinate the balance of the body and support the force of the limbs. It is the main part of the core area of the human body (Li, Z., & Xu, H.H., 2020). It can be seen that core strength training plays an important role. Strengthening the core parts of athletes, as the energy center of badminton players, can effectively improve the athletic ability and stability of



badminton players, improve the physical fitness and badminton skills of badminton players, and strengthen The physical stability and explosive power of badminton players allow badminton players to reduce their physical energy consumption in high-intensity competitions, to achieve better results, which is of great significance to badminton players (Yang, H., 2019). In the core strength training of badminton, the core strength refers to the strength of the muscles, ligaments, and connective tissues of the badminton player's core. Through a large number of professional core strength training, the muscle strength of the badminton player's core can be strengthened and the relationship between muscle strength can be promoted. Coordination among them (Li, C., 2020).

Now, in the training of college badminton special students, traditional strength training accounts for the majority, this method of focusing only on the training of large muscle groups and strength improvement has slowly departed from the pace of the times, and core strength training, which is aimed at the deep muscle groups and small muscle groups in the core area, has been paid attention to by more and more experts, scholars, teachers and coaches. In terms of the research relationship on the influence of core strength training on badminton technical movements, the experimental research of core strength training on the high clear stroke technique of badminton students in colleges and universities is blank. Based on the existing research background. This study takes this as an opportunity to explore the impact of the new training method of core strength training on the technical movements of college badminton talents through experimental methods, to put forward feasible suggestions for teaching and training.

Objectives

Compare with traditional training methods. Core strength training is more effective in improving students' physical fitness and badminton high clear stroke skills.

Literature Review

As Jiang, T. (2022) said, strength training has a long history. According to relevant research, there are many colorful murals about strength competitions in ancient Egyptian tombs. In our country more than two thousand years ago, when the military defense department was established, strength training was also carried out. So far, strength training has been applied in many fields, especially in the field of competitive sports. In the daily training of badminton, traditional strength training focuses on the upper and lower limbs, and insufficient attention is paid to the core strength training of the trunk. Different from traditional training methods, core strength training can help most athletes rapidly increase muscle endurance in a short period. Athletes lack core strength training, and it is difficult to maintain body balance during exercise. Lack of core strength training will affect the performance of athletes' technical movements on the field. As the research on core strength continues to increase, more and more people realize the importance of core strength training in sports, and the performance of athletes is closely related to the strength of their core strength. Scholars Sun, P., & et al. (2019) have a good definition of the relationship between traditional strength training and core strength training: In addition to the same basic requirements and training goals, the two training methods are both organic components of body strength and must complement each other to achieve promote its coordinated development. However, the advantage of core strength training compared with traditional strength training is that it updates the training concept and proposes new training methods and means, which can effectively improve the stability, coordination, and balance of the body. Core strength training is training the strength of the core muscles, improving the stability and coordination of the body, so that the athlete's body can reach the best state during exercise. Deng, P.C. (2020) also believes that the most important part of physical training is the training of athletes' core strength, which is an essential part of physical training. Paula, E. G et al. (2021) also made the point that core strength training can improve body composition, increase trunk strength, and increase muscle myoelectric activity. José M Oliva-Lozano (2020) defines the core: the core is an anatomical box made up of multiple muscle groups such as the rectus abdominis in the front, the internal and external obliques in the back, the lateral, The erector spinae, multifidus lumbar muscles, and quadratus lumborum muscles, the diaphragm and pelvic floor on the upper edge, and the iliopsoas muscle on the bottom. From a



practical standpoint, the core muscles are the center of the body where most of the kinetic chain transmits force to the extremities. However, the transverse abdominis, multifidus lumborum, and quadratus lumborum are considered key core muscles by fitness and health professionals. To sum up, the core part refers to the functional part composed of the four major human muscle groups the waist, abdomen, buttocks, and legs. These four parts form a whole, called the core part. It can be seen that the core muscles play a role in stabilizing the center of gravity and transmitting strength, and are the main link in the overall force development, which plays a vital role in improving athletes' sports performance.

Badminton is a highly confrontational activity. During the entire game, athletes need to constantly change their body positions and complete a large number of complex movements such as jumping, pedaling, and emergency stops. This not only requires athletes to have better coordination and balance. ability, but also requires strong control ability. Cheng, Y., & Wu, R.F. (2020) concluded through research that core strength training is one of the main training items in badminton training, which can improve the overall quality of badminton players. Ibrahim, H.I.H. (2017) has found through research that 8 weeks of core stability training can improve the ability of young badminton players to maintain optimal lower limb dynamic balance. Hong, Y., & Liu, H.P. (2019) concluded through research that core training can improve the stability of the lumbar spine and the explosive power of the upper and lower limbs of male college badminton players. It also has the effect of stabilizing and supporting the body posture, which can improve the speed and accuracy of badminton shots. Dong, H, Zhu, Z.H., Xu, L.T., & Yang, C.X. (2022) scholars have also shown through research that core strength is very important for badminton players and plays a key role in pace and technical practice. Only with the core can there be stability and conduction, and the impact of core strength training on badminton backcourt serving technology, whether it is from high-position clearing, hanging, or smashing, core strength training can promote badminton backcourt. The play of serving technique. Badminton backcourt technique improves the level of backcourt technique, improves the balance and stability of the body, reduces sports injuries in the process of backcourt technique training, and improves the winning rate in the game. In summary. Therefore, to improve the high clear stroke technique in students' badminton, it is necessary to improve the student's physical fitness, so that the high clear stroke technique can be effectively improved by improving the physical fitness.

Conceptual Framework

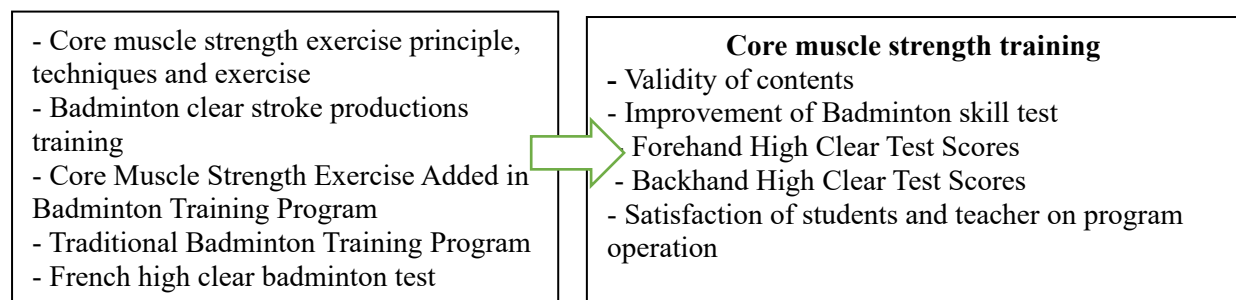


Figure 1 Conceptual Framework

Methodology

The population of this study is the students of the 2022 grade badminton special class of Guangxi Medical University, including 123 boys and 107 girls, a total of 230 students. 50% of the 115 students were randomly selected for the high clear stroke technology test, and the test scores of male and female high school students were ranked. The 20 students with the lowest male and female rankings were screened out, and a total of 40 students were selected as research subjects.

This research was divided into 4 Steps as follows:

Step 1 Consult experts and coaches to formulate the test standard of badminton high clear stroke technique for this study

Step 2 Select experimental research subjects for pre-experimental testing



1) Among the 230 students in the 2022 grade badminton special class of Guangxi Medical University, 40 students with low scores in the high-definition swimming stroke test were selected and randomly divided into two groups. The experimental group consisted of 20 students (10 males and 10 females) and 20 students in the control group. people (10 males and 10 females).

2) Conduct physical fitness tests on 40 students and collect data: 100m, 1-minute rope skipping, standing long jump, sit-ups.

3) Carry out badminton high clear stroke test and collect the pre-training test results of 40 students.

Step 3 The experimental group and the control group trained for 8 weeks, 2 sessions a week, 2.00 hours each session (60 minutes for physical fitness and 60 minutes for skills)

1) The experimental group performed core muscle strength training according to the training plan and badminton skills

2) The control group performed traditional strength training and badminton skills according to the training plan

Step 4 Analyze data and draw conclusions

1) According to the badminton high clear stroke technology test standard, test and collect data on 40 students in the experimental group and the control group

2) Conduct a physical fitness test on 40 students in the experimental group and the control group and collect data

3) Analyze the test data of the two groups of students before and after training and draw the results

4) 5 experts conducted IOC validating on this experiment

5) Conduct a satisfaction questionnaire survey on the students participating in the experiment

Results

1. Bioinformatics and physical fitness test scores of the experimental group and the control group before the experiment

Using the method of independent sample T-test, before the experiment, the students in the experimental group and the control group collected biological information tested four physical fitness items, and analyzed the differences. The purpose is to ensure that there is no difference in the indicators between the experimental group and the control group and to ensure the credibility and scientificity of the final research conclusion.

According to Table 1, it can be seen that the P values of age, height, and weight of the experimental group and the control group are greater than 0.05, indicating that there is no significant difference between the two groups, and experiments can be performed.

Table 1 biological data of subjects

Basic information	Experimental group	Control group	t	P-value
Age	18.31±0.48	18.5±0.52	-1	0.333
Height	171±6.45	171.81±7.8	-0.68	0.507
Weight	62.5±6.55	64.19±5.61	-1.636	0.123

Table 2 Physical fitness data of subjects



Physical Fitness	Experimental group	Control group	t	P-value
100M (s)	12.73±0.668	12.76±0.52	0.224	0.825
One-minute jump rope	42.5±10.12	149.05±10.23	-1.97	0.064
Standing long jump (cm)	191.45±27.67	190.55±27.65	0.187	0.854
Sit-ups	31.75±5.93	30.85±4.00	0.551	0.588

Table 2 is the difference analysis table of physical fitness test scores between the experimental group and the control group. It can be seen that the P values of the four physical fitness tests of the experimental group and the control group: 100M, one-minute rope skipping, standing long jump, and sit-ups are all greater than 0.05, indicating that there is no significant difference between the two groups, and their participation in the experiment will not affect the experimental results.

2. Comparative analysis of high clear stroke test scores before and after the experiment between the experimental group and the control group

It can be seen from Table 3 that in the test results of badminton high-definition strokes before the experiment, the average score of the average high-definition strokes of the experimental group was 70±2.92 points. The mean score of high-definition stroke in the control group was 71±3.43 points. As can be seen from the table, there was no significant difference between the two groups.

As shown in Table 3, the average score of the high-definition stroke technique test in the experimental group was 70±2.92 points before the experiment, and after 8 weeks of core strength training, the average score was 90.5±2.88 points, the T-test P value 0.001, the difference was significant. The average score of the control group before the experiment was 71±3.43 points, and the average score after 8 weeks of traditional strength training was 71.88±2.87 points. The P value of the mean score of the T-test is 0.069 (>0.05), indicating that the test result after the experiment is not significant. Combining the comparison results of the age, height, and weight data between the experimental group and the control group, the influence of individual differences in the experimental subjects was studied, and the influence of wind on the experimental results was excluded. (See Table 3).

Table 3 Comparative analysis of high clear stroke test scores before and after the experiment between the experimental group and the control group

Groups	high clear test scores		t	P-value
	Pre-test	Post-test		
Exp. group	70±2.92	90.5±2.88	-22.685	0.001*
Cont. group	71±3.43	71.88±2.87	-1.962	0.069

* df. 19 p<.05

The reason for the small difference before and after the experiment in the control group is that traditional strength training mainly exercises a certain part of the body's muscles. Muscles do their best work when hitting high balls in place, hitting the ball to the baseline. However, during the test. The tester needs to move from the center of the field to the bottom line of the left and right halves, and at the same time adjust the speed of the pace and the angle of the incoming ball according to the speed. At this time, more muscles of the whole body are required to participate, and the tester's ability to change speed and control the body is tested. Ensure that the body can maintain a stable center of gravity during the exercise, and hit the ball near the bottom line of the field. It proves that although traditional strength training has improved physical fitness, the ability to control the body has not improved, which is why there is not much difference in performance before and after the experiment, indicating that traditional strength training has little effect on improving physical fitness and improving badminton high-definition hitting skills big help.

Table 4 The comparison of posttest results on the high clear stroke tests between the experimental group and the control group.



test	Exp. Group $\bar{x} \pm SD$	Cont. group $\bar{x} \pm SD$	t	P-value
High clear	90.5±2.88	71.88±2.87	18.331	0.001*

*df. 39 p<.05

As shown in Table 4, in the test results of the high clear stroke technique after the experiment, in terms of the test scores of the experimental group and the control group, the average value of the experimental group was 90.5±2.88 points, and the average value of the control group was 71.88±2.87 points. The experimental group was 18.6 points higher than the control group. After the T-test, the P value was 0.001 (<0.01), and there was a significant difference.

3. Comparative analysis of physical fitness scores before and after the experiment between the experimental group and the control group

According to Table 5, before the experiment, the average 100m score of the experimental group was 12.73±0.668, the one-minute rope skipping score was 142.5±10.12, the standing long jump score was 191.45±27.67, and the sit-up score was 31.75±5.93. After 8 weeks of training, the average 100m score of the experimental group was 12.16±0.65, the one-minute rope skipping score was 153.4±6.24, the standing long jump score was 202.05±26.83, and the sit-up score was 38.5±4.88. Improvement, T test P value <0.001, indicating that there is a significant difference in the physical fitness of the experimental group before and after the experiment. The average 100m score of the control group was 12.76±0.52, the one-minute rope skipping score was 149.05±10.23, the standing long jump score was 190.55±27.65, and the sit-up score was 30.85±4.00. After 8 weeks of training, the average 100m score of the control group was 12.79±0.52, the one-minute rope skipping score was 148.25±9.35, the standing long jump score was 190.85±27.3, and the sit-up score was 31.25±4.04. The P values of these four physical qualities were all >0.001, indicating that there was no significant difference in the physical qualities of the control group before and after the experiment.

Table 5 Comparative analysis of physical fitness scores before and after the experiment between the experimental group and the control group

Groups	Physical Fitness	Pre-test	Post-test	t	P-value
Exp. group	100M (s)	12.73±0.668	12.16±0.65	24.034	0.001*
	One-minute jump rope	142.5±10.12	153.4±6.24	-8.855	0.001*
	Standing long jump (cm)	191.45±27.67	202.05±26.83	-8.125	0.001*
	Sit-ups	31.75±5.93	38.5±4.88	-13.447	0.001*
Cont. group	100M (s)	12.76±0.52	12.79±0.52	-1.674	0.11
	One-minute jump rope	149.05±10.23	148.25±9.35	1.165	0.258
	Standing long jump (cm)	190.55±27.65	190.85±27.3	-1.301	0.209
	Sit-ups	30.85±4.00	31.25±4.04	-2.629	0.017*

*df. p<.05

Table 6 The post-test results of the physical fitness of the experimental group and the control group were compared.

Physical Fitness	Exp. Group $\bar{x} \pm SD$	Cont. group $\bar{x} \pm SD$	t	P-value
100M (s)	12.16±0.65	12.79±0.52	-4.78	0.001*
One-minute jump rope	153.4±6.24	148.25±9.35	2.491	0.022*
Standing long jump (cm)	202.05±26.83	190.85±27.3	2.289	0.034*
Sit-ups	38.5±4.88	31.25±4.04	4.942	0.001*

*df. p<.05

As shown in Table 6, in the physical fitness test results after the experiment, the T-test of the two items of 100m and sit-ups showed a significant difference with a P value <0.01, while the T-test



values of the two items of one-minute rope skipping and standing long jump All < 0.05 , it can be seen that there are significant differences in the physical fitness test scores of the experimental group and the control group after the experiment.

Conclusion

The core muscle strength exercise added to the badminton training program was created by the researcher and validated with 5 experts by IOC technique the IOC was 0.925 ± 0.1438 .

The Program was confirmed by the execution of a group pretest and posttest experimental design. The subject was 40 students who tested with a high clear stroke test, then took the score to rank the subjects descending and sampling with systematic method into 2 groups. The experiment operated for 8 weeks, 2 sessions a week and 2 hours a session. Collect high clear stroke test and fitness test scores after the last class, and then compare test scores within and between groups;

1. Adding core muscle strength training to the badminton training plan can obtain a clearer hitting ability than traditional badminton training at the 0.05 significance level.

2. Core muscle training can improve students' physical fitness.

3. It can be concluded that core muscle training is more helpful and effective for producing badminton high clear strokes.

Discussion

The results show that core strength training can not only effectively improve the physical fitness of students, but also has a better effect than traditional strength training in improving badminton high clear stroke technology. Badminton is a test of athletes' psychology, technique, and physical fitness, in the game, the lower limbs do a wide range of running, emergency stops, and sharp turns at the same time, and the upper limbs play high clear strokes. Athletes lack core strength training, and it is difficult to maintain body balance during exercise. Lack of core strength training will affect the performance of athletes' technical movements on the field. The essence of core strength training is to help athletes coordinate their balance, be able to easily cope with competitions and training, exert professional ability of athletes, strengthen their strength and self-confidence of athletes, and finally realize the same value of life.

Core training mainly focuses on the endurance of the waist and abdomen, the neuromuscular control of the waist and abdomen, and the stability and explosiveness of the shoulder joint; strengthening the core training can stabilize and support the power transmission, body posture, sports skills, and technical movements when hitting the badminton effect. 8 weeks of core stability training can improve the ability of young badminton players to maintain optimal lower limb dynamic balance (Ibrahim, H.I.H., 2017). Core training can improve the stability of the lumbar spine and the explosive power of the upper and lower limbs of male college badminton players. It also has the effect of stabilizing and supporting the body posture, which can improve the speed and accuracy of badminton shots (Hong, Y., & Liu, H.P. 2019). Core strength is very important for badminton players and plays a key role in pace and technical exercises. Only with the core can there be stability and conduction, and the impact of core strength training on badminton backcourt serving technology, whether it is from high-position clearing, hanging, or smashing, core strength training can promote badminton backcourt. The play of serving technique. Badminton backcourt technique improves the level of backcourt technique, improves the balance and stability of the body, reduces sports injuries in the process of backcourt technique training, and improves the winning rate in the game (Dong, H, Zhu, Z.H., Xu, L.T., & Yang, C.X. 2022). It can be concluded that core muscle training can improve students' physical fitness. Core muscle training is more helpful and effective for producing badminton high clear strokes.

Recommendation

Application of research results



1. Under the situation of the development of modern competitive sports, schools should pay more attention to the physical fitness of students and the teaching quality of badminton.
2. In the daily badminton special classroom teaching, teachers should pay attention to combining the core strength training content with the badminton special technical movements.
3. The results of this study have certain reference significance for relevant experts to formulate a long-term and effective core strength training plan and scientific and reasonable evaluation indicators based on the characteristics of badminton.

For the next research

1. Extend the experimental period, to make the experimental data more accurate, it is recommended that the experimental period be a full year.
2. To expand the sample size and expand the scope of research, it is recommended to select students from badminton classes from many universities as experimental subjects to improve the persuasiveness of experimental results.

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