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Effects of Core Strength Training Program to Improve Table Tennis Forehand and Backhand Smash of University Students in Nanjing City The People's Republic of China

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Abstract

Background and Aim: The forehand and backhand smash is one of the most important techniques in table tennis. It can be seen from the early data that the smash technique has a very important effect on the result of the match. The purpose of this study is to explore the effectiveness of a core strength training program on improving the effect of forehand and backhand smashes of table tennis in Nanjing college students.

Materials and Methods: This study is quasi-experimental. The study population was 60 students currently studying in the 2023 academic year at Nanjing Sport University, all of whom were students in the table tennis club. The 60 students will take the forehand and backhand smash test and record their scores. According to the test scores, 30 students ranked 16-45 were selected as samples. Since students at the top of the rankings are likely to have better skills and those at the bottom are fewer, the reliability of the research can be better reflected by selecting students in the middle of the rankings. In this experiment, the training will last for 8 weeks, including 2 hours a day, 5 days a week. In addition, forehand and backhand smash speed and accuracy tests were performed before training, after 4 weeks, and after 8 weeks, respectively. In this study, mean, standard deviation, one-way repeated measurement ANOVA, and dependent T-test were used to analyze the data.

Results: After the core strength training, the forehand and backhand smash speed test and accuracy test results between the pre-test, 4-week training, and post-test were all below 0.05 level, and this study had statistical significance.

Conclusion: Through scientific methods and empirical data, this study fully proves that core strength training has a significant effect on improving the speed and accuracy of table tennis forehand and backhand smash, which is consistent with the hypothesis of this study.

Keywords: Table Tennis; Core Strength Training; Forehand and Backhand Smash; University Students

Introduction

Table tennis forehand and backhand smash is one of the important techniques of table tennis. Starting from many actual data in the early days, the smash technique of table tennis has a very important impact on the result of the match. Players with good smash technique can not only score directly but also create good opportunities for subsequent attacks to improve the winning rate of the match. Especially in the match against the opponent, the quality of the forehand and backhand smash plays a very important role in the whole match. The most important point in the table tennis smash technique is the control of speed and accuracy. To improve the speed and accuracy of the smash, it requires a high degree of coordination of the muscles of the whole body and precise control of the force of each link.

In recent years, more and more studies have shown that core strength training has a positive impact on the skill level of table tennis players. For example, Zhang et al (2015). found that core strength training can effectively improve the receiving skills of table tennis players. In addition, Li et al (2016) found that core strength training can improve the footwork movement and hitting stability of table tennis players. There are relatively few research documents on the influence of core strength on the service of table tennis students. Although table tennis coaches pay full attention to core strength training, they do not go deep into the receiving skills of table tennis. Therefore, this study has a certain theoretical significance and practical value for this field. It can further enrich the theoretical system of table tennis receiving technical training, enrich the physical training content of table tennis students; provide specific methods and programs for table tennis coaches to organize core strength training, and provide theoretical reference for improving the

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receiving technology of table tennis students.

In the past, the university table tennis team mostly used a single experience mode, focusing on regular and repetitive training. For example, some training programs often emphasize a fixed rhythm and a specific pitch, allowing athletes to practice repeatedly until muscle memory is formed. Although this approach improves the athletes' ability to respond to regular returns in a short time, it shows obvious limitations in actual matches.

To sum up, the influence of core strength training on the forehand and backhand smash of table tennis players has attracted the attention of most scholars. Through the analysis of the techniques of forehand and backhand smash, as well as the research of training methods and means, this paper provides references and suggestions for the training, mastering, and application of table tennis players, and lays a solid foundation for the development of table tennis in China.

Research Objectives

Main Objective

To study the effects of a core strength training program to improve table tennis forehand and backhand smash of university students in Nanjing City.

Subsidiary Objectives

1. To study the problems and obstacles of forehand and backhand smashes in table tennis training among university students in Nanjing City.
2. To develop a core strength training program to improve the table tennis forehand and backhand smash of university students in Nanjing City.
3. To compare the effects of the core strength training program on table tennis forehand and backhand smashes of university students Pre-training, Mid of training, and Post of training.

Literature Review

1. Table tennis

Table tennis was born in the late 19th century as a leisure and entertainment activity for the upper class, and then spread throughout Europe and the world. By the early 20th century, it had gradually developed into a competitive, regulated, organized, and formal sport. Before the 1980s, the world table tennis scene went through stages such as European dominance, Japanese dominance, China's rise, and Eurasian confrontation. From the 1980s to the present, China has dominated the table tennis world and has almost won all the medals in international table tennis competitions. At the 50th Yokohama World Table Tennis Championships in 2009, the Chinese team once again won all the gold and silver medals in all five events. Once again, it proves the strong strength of Chinese table tennis, but the good news is that the Chinese team has won the championship, and the runner-up is coming, and the domestic media is not cheering, but instead falling into a state of sadness. (Liu, 2008) CCTV celebrity Bai Yansong even exclaimed in "News 1+1" that "table tennis is at its most dangerous moment, and no one will play it in a hundred years." (Wu et al, 2010). The current new pattern in the table tennis industry has brought huge hidden concerns.

2. Core strength training

2.1. The theoretical basis of the core strength training

Core strength training refers to a form of strength training. The so-called "core" is the middle link of the human body, which is the area below the shoulder joint and above the hip joint, including the pelvis, which is a whole formed by the waist, pelvis, and hip joint, including 29 muscles. The core muscle group is responsible for stabilizing the center of gravity, conducting force and other functions, and is the main link of the overall force, and plays a pivotal role in the activity and force of the upper and lower limbs. The strong core muscle group plays a stable and supportive role in the body posture, motor skills, and special technical movements of athletes in sports. Therefore, anyone with a graceful posture, strong body control, and balance must have a well-trained core muscle group. Then core strength training can be understood as

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a form of training to develop the strength of the human core muscle group.

Wang Weixing, a professor at Beijing Sport University, believes that the core is a whole formed by the waist, pelvis, and hip joint, which refers to the middle link of the human body, specifically the area below the shoulder joint and above the hip joint including the pelvis, including the muscle group of the back, the abdomen and all the muscle groups that constitute the bottom of the pelvis. The core refers to the central link of the human body, mainly refers to the shoulder joint below, the hip joint above, including the pelvis and a whole, including 29 muscles, including rectus abdominis, internal and external oblique abdominal muscle, and iliopsoas muscle. The core muscle group plays the role of stabilizing the center of gravity and transmitting force and is the main link of the overall force of the human body and plays a connecting role in the force and activity of the upper and lower limbs of the human body. Based on the concept of the core and the function of a core muscle group, scholars have put forward their views on the concept of core strength. Although scholars have different opinions on the concept of core strength, they generally agree on the following points: First, core strength is a kind of power ability; Second, the core strength comes from the human neuro-core musculature system; Third, the core force has the role of stabilizing, controlling and coordinating the whole body. To sum up the views of the above scholars, this paper defines core strength as the ability to stabilize, control, and coordinate the body, which is generated by the neuromuscular system that innervates the core muscles or muscle groups and other tissues of the human body (Wang and Li, 2007).

3. Forehand smash

Forehand smash is a kind of masterstroke technology, which has the fastest flight speed, the shortest landing time, the largest force provided by the human body, and the fastest hand speed. It is a kind of sport that approximately pursues the limit of the human body. To obtain these "most", it is necessary to coordinate the various parts of the athlete's body. (Wang, 2015)

4. Backhand smash

Backhand smash is an important offensive technique in table tennis, which is mainly used to score quickly. Its features include hitting the ball from the side of the body, a fast swing combined with the strength of the legs and waist to ensure the speed and power of the ball. Players need to have good physical coordination and quick reaction ability to improve the accuracy and stability of the shot, while you can increase the rotation as needed to increase the difficulty of the opposing team to catch the ball. Through repeated practice, players can flexibly use this technology to enhance their offensive ability in the game. It's prepared in the same way as a forehand smash. But eventually, the force goes in the opposite direction, and the arm and wrist should move forward faster. The point of impact should be as high and forward as possible to facilitate the play of power. Although the backhand stroke is not very powerful, it has its suddenness. In actual combat, taking advantage of the opponent's unpreparedness and occasionally using backhand shots (because backhand shots are almost no threat and the opponent's mind is relaxed) can also achieve surprising victory effects (Gao, 2018).

5. Influence of core strength training on forehand and backhand smash

Core strength training has a significant influence on the forehand and backhand smash of table tennis players. First, strengthening the core can improve the stability of the body, helping the athlete maintain good balance when hitting the ball, thus reducing mistakes. Secondly, the strong core strength helps to transmit power more effectively, making the power of the shot more consistent and improving the power of the shot. In addition, core strength training can also increase the flexibility and control of athletes, so that they can move quickly and change the Angle of the ball more accurately. At the same time, strengthening the core helps to improve endurance, reduce fatigue during competition, and maintain a high level of performance. Finally, a strong core can effectively prevent sports injuries, protect the spine and joints, and thus ensure the long-term health and fitness of athletes.

The role of core strength in table tennis training. Improve your batting consistency. Table tennis players often need to move their pace and adjust their center of gravity to cope with the rotation and variability of table tennis, accurately hit the ball, and achieve good hitting effects, so the body of the players

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is always in a dynamic change, how to coordinate the force to hit the ball in this state is the embodiment of the level of table tennis players. The quality of a complete batting movement mainly depends on the level of cooperation between the muscles involved in the movement and the control of the center of gravity of the body during the movement, that is, the strength level of the muscles around the waist, abdomen, and pelvis (core strength). (Guo, 2011).

6. Principles of training

1. Functional training

Simulation action: When designing training, try to simulate the hitting action of table tennis. For example, a rubber band is used for lateral stretching that mimics body rotation when hitting a ball.

Multi-directional training: Training should cover front and back, side to side, and rotation movements to strengthen the core in different directions.

2. Whole body coordination

Compound exercises: Choose compound strength training exercises, such as squats, hard pulls, and presses, which work for multiple muscle groups at the same time and improve overall coordination.

Core and limb coordination: Focus on working with the core muscles and limbs in training, such as adding arm or leg movement when doing planks.

3. Stability and balance

Balance training: The use of balance boards, fitness balls, and other equipment for training, can effectively improve the stability of core muscles, and enhance the ability to balance in a dynamic state.

Single-leg training: Single-leg standing and squat training to enhance the coordination and balance of lower limbs and core.

4. Combine power with explosiveness

Strength training: Perform basic strength training, such as barbell squats and hard pulls, to improve overall strength.

Explosive power training: Combined with jump training (such as box jump, and squat jump), improve the explosive power of the core to help generate power quickly during the smash.

5. Progressive load

Build up intensity: Start with basic core strength training and gradually increase the intensity and complexity of the training, such as adding weights or using more challenging movements.

Monitor progress: Regularly evaluate the effects of training and adjust the training program to ensure that the athlete can continue to improve.

6. Variety and fun

A variety of training methods: combine different training methods, such as yoga, Pilates, functional training, etc., to keep the training fresh.

Team training: Train your teammates to increase interaction and competition and make training more fun.

7. Recovery and nutrition

Proper recovery: Ensure adequate recovery time after training to avoid fatigue and injury caused by overtraining.

Nutritional supplements: Proper diet and nutritional supplements are essential for core strength improvement, ensuring adequate protein and carbohydrate intake to support training.

In summary, from the existing research, the influence of core strength training on forehand and backhand smashes in table tennis has been widely discussed. Through experiments and observations, researchers have found that core strength training can improve athletes' hitting power, physical coordination, accuracy, reaction speed, and endurance. These factors are of great significance in table tennis competitions, which can improve the quality and success rate of players' spikes. However, the current research mainly focuses on the analysis and description of individual cases, and there is a lack of systematic and in-depth research on the influence of core strength training on the forehand and backhand smash in table tennis. Therefore, future research can be expanded from the following aspects:

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1. In-depth study on the influence mechanism of core strength training on forehand and backhand strokes in table tennis and explore its action mechanism.

2. Comparative study on the influence of different training methods and intensity on forehand and backhand smashes in table tennis.

3. Study the impact of combining core strength training with other training methods (such as technical training, physical training, etc.). In table tennis, forehand and backhand smash the ball.

4. Conduct group research on table tennis players of different levels to explore the universality and difference of core strength training on forehand and backhand smashes in table tennis.

Through these studies, we can understand the influence of core strength training on forehand and backhand smashes in table tennis more comprehensively and provide more scientific guidance for the training and competition of table tennis players.

Conceptual Framework

The conceptual framework for this research is as follows:

1. The independent variable is the core strength training program.

2. The dependent variable is the improvement of speed and accuracy of the forehand and backhand smash of students in the table tennis club.

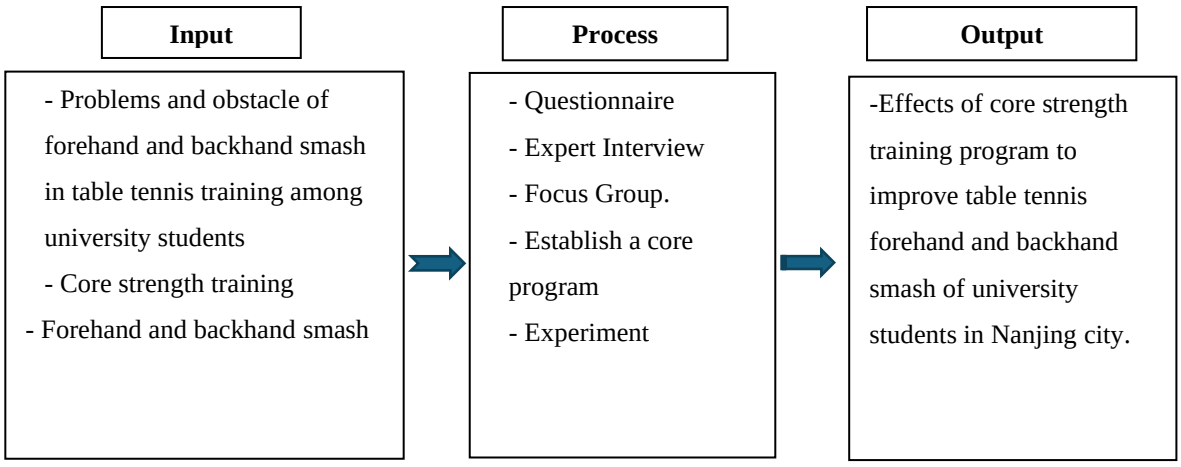

Figure 1 Conceptual framework

Methodology

1. Research Tools: In this research, the following tools were used to conduct the research:

1.1A questionnaire for students was used to understand the problems and obstacles in the core strength training of college students' table tennis fore-and-backhand smash training.

1.2Expert interviews assess the issues in the table and establish a focus group framework.

1.3Focus group to develop a core strength training program.

1.4Speed and accuracy test of forehand smash

1.5Speed and accuracy test of backhand smash

2. Population and Sample

*Population specification and size:*The study population was 60 students currently studying in the 2023 academic year at Nanjing Sport University, all of whom were students in the table tennis club.

Sample: 60 students will participate in forehand and backhand smash tests and record their scores. According to the test scores, 30 students ranked 16-45 were selected as a sample. Since the students at the top of the ranking may have better skills and the ones at the bottom are poor, the reliability of the research can be better reflected by selecting students in the middle of the ranking.

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3. Data Collection

1. The survey questionnaire will be distributed to all 30 students through on-site distribution to understand the problems and obstacles in the core strength training of university students in the forehand and backhand smash training process of table tennis.

2. Draft the questions to be used in expert interviews and evaluate their consistency with the objectives of 3 experts through an index of Item-Objective Congruence (IOC), to evaluate the questions in the expert interview form.

3. 5 experts, including table tennis coaches, physical education teachers, and academic experts, were invited for face-to-face interviews to establish a focus group problem framework, focusing on discussing the basic components of developing a core strength training program to improve table tennis forehand and backhand smash skills.

4. 10 experts, including table tennis coaches, physical education teachers, and academic experts, conducted a focus group study and developed a core strength training program aimed at improving table tennis forehand and backhand smashes in table tennis for university students.

5. Implement an 8-week training program, with 5 days per week and 2 hours of training per day.

6. Conduct forehand and backhand smash tests before the start of training, after 4 weeks of training, and after 8 weeks of training. Subsequently, the collected test data was analyzed and compared to study the effect of core strength training programs for improving core strength and their impact on forehand and backhand smashes.

4. Data Analysis

Descriptive statistical techniques, such as calculating the mean and standard deviation, are employed to analyze the data gathered from the questionnaire.

Evaluate the content validity of the questions in the expert interview form, by using the Indexes of Items of Objective Congruence (IOC), IOC value = 0.6-1.00.

The results of the pre-test, after 4 weeks of training, and post-test (after 8 weeks of training) were analyzed by using one-way ANOVA.

Dependent t-tests were employed to compare the test results between (1) the pre-test and after 4 weeks of training; (2) after 4 weeks of training and post-test; and (3) the pre-test and post-test, to evaluate differences within one group.

In this research, a level of significance of p = 0.05.

When assessing the mean score derived from expert-provided information, the researcher utilized the Likert scale to ascertain the average measure score. The scale's evaluations range from 1 = Lowest, 2 = Low, 3 = Moderate, 4 = High, 5 = Highest. The score criteria details are outlined below.

Average score range	Meaning
1.00 - 1.79	Lowest
1.80 – 2.59	Low
2.60 – 3.39	Moderate
3.40 – 4.19	High
4.20 – 5.00	Highest

Results

1. This paper discusses the current situation and problems of core strength training and table tennis forehand and backhand smashes of university students.

Questionnaire analysis:

Questionnaires were distributed to 30 college students to study the problems and obstacles existing in the core strength training and table tennis forehand and backhand smash of university students

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Table 1 Questionnaire results before testing

Questionnaire items	Total		Result
	$\bar{X}$	SD	
Whether you have done targeted core strength training	2.6	0.71	Moderate
How much do you think core strength training helps your forehand to work out	3.33	0.94	Moderate
How much do you think core strength training can help your backhand drive	2.93	0.93	Moderate
How does your forehand know	2.83	0.77	Moderate
How does your backhand work	2.76	0.50	Moderate
Do you think the core strength training will lead to injuries	4.34	0.64	Highest
Do you think adding core strength training to table tennis can improve your athletic skills	4.72	0.58	Highest
Are you willing to participate in the targeted core strength training	5.00	0.00	Highest
Are you satisfied with the current training site	3.40	0.62	High
Would you like to share your core strength training experience	2.58	0.60	Moderate

Table 1, the results of the questionnaire survey about core strength training and table tennis forehand and backhand smashes of university students. The students of core strength training and whether can improve table tennis forehand and backhand smash ability have many problems, these can be from the questions "Are you targeted to do core strength training" and "Do you like to share the core strength training experience", the score of the problem is "Moderate". However, we can also find from the question "Do you want to participate in the targeted core strength training" that the students have a high enthusiasm for the special core strength training. The question was given a full score of "Highest".

2. Develop a core strength training program aimed at improving the forehand and backhand smash ability of table tennis club students.

After conducting the focus group, a core strength training program was developed, and the core strength training program would be conducted for 8 weeks, scheduled for 2 hours a day, 5 days a week. After that, 30 community students performed core strength training to assess its suitability for use. It is found to be suitable for lifting the table tennis forehand and backhand smash. From the test results, it was found that the training program was designed with appropriate exercises and training intensity for acceptable students.

3. Training by using a developed core strength training program

To determine that the core strength training plan developed can improve the forehand and backhand smash ability of table tennis club students, this study conducted a test on the speed and accuracy of forehand and backhand smash. The test was divided into three stages: before the training, after 4 weeks of training, and after the completion of 8 weeks of training plan. Forehand and backhand smash speed test and accuracy test results are as follows:

4. Forehand speed test results

Table 2 Forehand speed test results (N=30)

Stage	Mean（$\bar{X}$）	Standard deviation （S.D.）
Pre-test	4.96±0.21	0.21
After 4 weeks of training	6.30±0.08	0.08
Post-test	7.25±0.14	0.14

Table 2 shows the results of the forehand speed test at different stages. In the pre-test, the mean velocity was 4.96 m/s and the standard deviation was 0.21 m/s. After 4 weeks of training, the mean speed

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was 6.30 m/s and the standard deviation was 0.08 m/s. After 8 weeks of training, the mean speed was 7.25 m/s and the standard deviation was 0.14 m/s. The data show that forehand speed has different mean and standard deviation, which reflects the distribution of test results in each stage.

Table 3 Results of the forehand ANOVA analysis

Period	Speed	ANOVA	
		F	P
Pre-test	4.96±0.21		
After 4 weeks of training	6.30±0.08	170.10*	0.00
Post-test	7.25±0.14		

* P＜.05

The analysis of variance in Table 3 showed that F is 170.1 and P is less than 0.05, indicating that the speed difference between different test periods is statistically significant.

Table 4 T-test the results for multiple comparisons

Stage	$\bar{X}$	S. D.	T	P
Pre-test	4.96	0.21	−19.50*	0.00
After 4 weeks	6.30	0.08		
Pre-test	4.96	0.21	23.75*	0.00
Post-test	7.25	0.14		
After 4 weeks	6.30	0.08	44.67*	0.00
Post-test	7.25	0.14		

* P＜.05

The t-test results in Table 4 showed that the test values of forehand smash speed in different stages of training are compared. The P values were significantly less than 0.05, indicating that there were significant differences in data distribution, which had a statistical basis.

5. Backhand speed test results

Table 5 Results of backhand speed test (N=30)

Stage	Mean（$\bar{X}$）	Standard deviation（S.D.）
Pre-test	4.75±0.20	0.20
After 4 weeks of training	6.20±0.15	0.15
Post-test	7.10±0.13	0.13

Table 5 shows the results of the backhand speed tests at different stages. In the pre-test, the mean velocity was 4.75 m/s and the standard deviation was 0.20 m/s. After 4 weeks of training, the mean speed was 6.20 m/s and the standard deviation was 0.15 m/s. After 8 weeks of training, the mean speed was 7.10 m/s and the standard deviation was 0.13 m/s. The data show that the backhand velocity has different mean and standard deviation, which reflects the distribution of experimental results in each stage.

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Table 6 Results of the backhand ANOVA analysis

Period	Speed	ANOVA	
		F	P
Pre-test	4.75±0.20		
After 4 weeks of training	6.20±0.15	12.50*	0.00
Post-test	7.10±0.13		

* P＜.05

The analysis of variance in Table 6 showed that the F value is 12.5 and the P value is less than 0.05, indicating that the speed difference between different experimental stages is statistically significant.

Table 7 T-test the results for multiple comparisons

Stage	$\bar{X}$	S.D	T	P
Pre-test	4.75	0.20	79.22*	0.00
After 4 weeks	6.20	0.15		
Pre-test	4.75	0.20	49.19*	0.00
Post-test	7.10	0.13		
After 4 weeks	6.20	0.15	92.16*	0.00
Post-test	7.10	0.13		

* P＜.05

The t-test results in Table 7 showed that the test values of backhand smash speed in different training stages are compared. The P values were significantly less than 0.05, indicating that there were significant differences in data distribution, which had a statistical basis.

7. The forehand accuracy results

Table 8 Forehand accuracy test results (N=30)

Stage	Mean（$\bar{X}$）	Standard deviation（S.D.）
Pre-test	7.20±0.88	0.88
After 4 weeks of training	8.00±0.85	0.85
Post-test	8.50±0.70	0.70

Table 8 shows the test results of forehand accuracy in different stages. In the pre-test, the average accuracy was 7.20, and the standard deviation was 0.88. After 4 weeks of training, the mean accuracy was 8.00, and the standard deviation was 0.85. After 8 weeks of training, the mean sample accuracy was 8.50, and the standard deviation was 0.70. These data provide the mean and standard deviation of forehand accuracy at each stage.

Table 9 Results of the forehand ANOVA analysis

Period	Accuracy	ANOVA	
		F	P
Pre-test	7.20±0.88		
After 4 weeks of training	8.00±0.85	7.50*	0.00
Post-test	8.50±0.70		

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* P＜.05

Table 9 shows the analysis results of ANOVA for the accuracy of forehand smash. The F value is 7.50 and the P value is less than 0.05, indicating that the differences between different test stages are statistically significant.

Table 10 T-test results for multiple comparisons

Stage	$\bar{X}$	S.D	T	P
Pre-test	7.20	0.88	39.80*	0.00
After 4 weeks	8.00	0.85		
Pre-test	7.20	0.88	27.32*	0.00
Post-test	8.50	0.70		
After 4 weeks	8.00	0.85	50.98*	0.00
Post-test	8.50	0.70		

* P＜.05

The t-test results in Table 10 showed that forehand smash accuracy test values in different training stages are compared. The P values were significantly less than 0.05, indicating that there were significant differences in data distribution, which had a statistical basis.

9. Backhand accuracy results

Table 11 Backhand accuracy test results (N=30)

Stage	Mean（$\bar{X}$）	Standard deviation（S.D.）
Pre-test	5.70±1.17	1.17
After 4 weeks of training	7.00±1.05	1.05
Post-test	7.50±0.90	0.90

* P＜.05

Table 11 shows the results of the backhand accuracy test at different stages. In the pre-test, the average accuracy was 5.70, and the standard deviation was 1.17. After 4 weeks of training, the mean accuracy was 7.00, and the standard deviation was 1.05. After 8 weeks of training, the mean accuracy was 7.50 and the standard deviation was 0.90. The data in the table reflect the average backhand accuracy and its deviation before the test, after 4 weeks of training, and after the test.

Table 12 Results of the backhand ANOVA analysis

Period	Accuracy	ANOVA	
		F	P
Pre-test	5.70±1.17	6.20*	0.00
After 4 weeks of training	7.00±1.05		
Post-test	7.50±0.90		

* P＜.05

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In Table 12, the ANOVA results of the accuracy of the backhand smash clearly show that the F value is 6.20 and the P value is less than 0.05, indicating that the differences between different test stages are statistically significant.

Table 13 T-test for multiple comparisons results

Stage	$\bar{X}$	S.D.	T	P
Pre-test	5.70	1.17	47.43*	0.00
After 4 weeks	7.00	1.05		
Pre-test	5.70	1.17	22.84*	0.00
Post-test	7.50	0.90		
After 4 weeks	7.00	1.05	54.55*	0.00
Post-test	7.50	0.90		

* P＜.05

The t-test results in Table 13 showed that the accuracy test values of backhand smashes in different stages of training are compared. The P values were significantly less than 0.05, indicating that there were significant differences in data distribution, which had a statistical basis.

In Summary, the study concluded that the training of core strength significantly improved the forehand and backhand smash ability of Nanjing University table tennis students. The program provides an integrated approach to improving table tennis skills by integrating traditional and innovative training methods. Therefore, this study provides valuable suggestions for coaches and educators to design effective training programs to improve ping-pong-specific athletic ability.

Conclusion

The results show that after 8 weeks of targeted training, core strength training can significantly improve college students' tennis forehand and backhand hitting ability. This can be seen in the speed of the forehand and backhand strokes as well as the results of the improved accuracy test. There were statistically significant improvements in speed and accuracy tests before and after 4 weeks of training and after 8 weeks of training. Through scientific methods and empirical data, this study fully proves that core strength training has a significant effect on improving the speed and accuracy of table tennis forehand and backhand smashes, which is consistent with the hypothesis of this study.

Discussion

After 8 weeks of targeted training program training, the core strength training program can significantly improve university students' table tennis forehand and backhand smash ability. In the research field of the core strength training of table tennis, the research results of many scholars provide a wealth of theoretical support and practical guidance. Zhang et al (2015) discussed the impact of training on the receiving skills of table tennis students and conducted in-depth research on improving footwork and hitting stability. These studies not only laid the foundation for the theoretical construction of the 8-week training program but also supported the importance of core strength training in the development of table tennis skills through empirical data. Forehand and backhand smash test results before training, after 4 weeks of training, and after 8 weeks of training found that the improvement of core strength can improve the ability of forehand and backhand smash. From the perspective of general strength under core strength. This consistent research result of Wang and Li (2007) although core strength training and traditional strength training can solve the problems of special strength training, core strength training adopts new training concepts and novel training methods, breaking the traditional

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training methods, which can not only improve the strength of athletes, but also promote the development of comprehensive quality of athletes. Core strength training method, which has been practiced and verified in this experiment. Guo (2011) discussed in depth the stability of the core and the strength of the core, providing theoretical support for the scientific nature of training programs.

Through systematic training and testing of 30 students, they not only witnessed significant progress in their technical level but also deeply recognized the core role of core strength in improving table tennis skills. This series of research and practice will undoubtedly provide valuable experience and inspiration for the long-term development of table tennis in China.

Recommendation

Recommendation for current research

1. According to students 'physical fitness and technical differences, customize personalized training programs to ensure that the training content and intensity match students' abilities and promote the comprehensive improvement of their technology.
2. In addition to core strength training, comprehensive skills such as footwork, reaction speed, and tactical understanding should also be strengthened to enhance athletes' competitive performance.
3. Implement scientific recovery strategies, including reasonable rest, nutrition adjustment, and stretching, to optimize the training effect and reduce the risk of sports injury.
4. Regular training effect evaluation, and timely feedback to students, so that coaches and students can adjust their training strategies according to the feedback.
5. Integrate more practical drills and theoretical explanations into the training to improve students' technical understanding and application ability and enhance the effectiveness of the training.

Recommendation for further research

1. Long-term effect evaluation: It is recommended that future studies should conduct a long-term evaluation of the effect of core strength training and analyze the impact of training on the long-term competitive state and physical fitness by continuously tracking the performance of athletes.
2. Analysis of multi-dimensional training effect: Future studies should consider evaluating the training effect from multiple dimensions and explore the comprehensive impact of different training methods on athletes' technology, psychology, and learning effects from the perspectives of biomechanics, psychology, and pedagogy.

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