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Comprehensive Training Program in Badminton for Students Majoring in Sports Training Program of College

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Abstract
Background and Aims: A structured training program in badminton is essential for improving players' technical skills, agility, and endurance, allowing them to perform to their full potential. It also aids in injury prevention and mental conditioning, which are critical for consistent performance and competitive success. The main objective of this study is to construct a comprehensive badminton training program to improve the factors that affect the badminton performance of badminton students majoring in sports training.
Methodology: The subjects of this study are badminton students majoring in sports training at Xi'an Physical Education University. The total sample size of this study is 221 people. 60 students were selected by systematic sampling, including 30 males and 30 females, and 21 experts were selected by snowball sampling, including 18 males and 3 females. The main research methods are the literature method, questionnaire survey method, Delphi method, and ANOVA analysis method. The instruments used in this study are:1. Comprehensive badminton training program.2. Expert questionnaire.3. Physical fitness test.4. Badminton skill test.5. Psychological test. Data such as mean, standard deviation, and ANOVA test statistics were used in the study.
Results: The results of this study found that: 1. Through the literature method and the questionnaire survey of experts, the factors affecting badminton performance were determined to be physical fitness, skills, tactics, psychology, and warm-up, and the badminton comprehensive training program was determined to consist of five parts: warm-up, physical fitness, skills, tactics, and psychology through the Delphi method. 2. By setting up the experimental analysis results, it was found that the use of traditional training programs did not significantly change the impact of badminton specialty students' performance factors. 3. By setting up the experimental analysis results, it was found that the experimental group had a significant change in the impact of the badminton comprehensive training program on the performance factors of badminton specialty students.
Conclusion: The study concluded that a comprehensive badminton training program, which includes warm-up, physical fitness, skills, tactics, and psychology, significantly improves performance factors in badminton students when compared to traditional training programs, which had no significant effect. This demonstrates the effectiveness of a comprehensive, methodologically developed training approach in improving badminton performance.
Keywords: Comprehensive Badminton Training Program; Sports Training Major; University Badminton Special Students

Introduction

Badminton has always been the traditional advantage event of Chinese sports. Chinese badminton has made remarkable achievements in the competitive field. In large international competitions, the Chinese badminton team has won world championships many times and won honors for the country. Among them, the Olympic Games as the world's highest level of sports event, the Chinese badminton team had achieved excellent results in the previous Olympic Games, and won many gold medals, silver medals, and bronze medals. In China, badminton has also been vigorously promoted and popularized, and various amateur competitions and youth training activities have emerged in an endless stream, which laid a solid foundation for the long-term development of China's badminton industry (Tian, 2010)

At the competitive level, the technical level and strength of Chinese badminton players have been recognized by the international badminton community. With the retirement of the golden generation of Chinese badminton, the Chinese badminton team has lost its previous dominance in international competitions, especially in men's and women's singles. The younger generation of players has not performed well in taking on the responsibilities and missions of their predecessors, and Chinese badminton is experiencing the pain of transformation. This paper aims to solve some problems in the training of Chinese badminton talents by formulating a comprehensive badminton

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training plan, and actively responding to China's current education policy of "integration of sports and education".

A comprehensive training program is the key to improving an athlete's level. It can record the actual situation of each training session and flexibly adjust the intensity and load of subsequent training accordingly. In addition, it can regularly evaluate and review the training results. Such a plan is necessary for every athlete because it plans the training schedule, making the training more purposeful and efficient.

As an important part of society and an important group in higher education, college students are the basic force for promoting social development and progress. Improving the badminton skills of college students majoring in sports is crucial to promoting the progress of Chinese badminton. Through an effective badminton training program, these college students with higher education can improve their badminton level and give back to society, cultivate more badminton talents, and form a virtuous circle. Therefore, formulating a reasonable and effective comprehensive badminton training plan is the key to the key.

To sum up, precisely because of the unsatisfactory performance of Chinese badminton players at this stage and the difficulty in replacing the old with the new, this study will focus on constructing a comprehensive badminton training program to cultivate better badminton players and badminton coaches for Xi'an Physical Education University, thereby promoting the better development of China's badminton project.

Objectives

1. To find the factors affecting badminton performance.
2. To formulate the training program to improve the factors affecting badminton performance in students majoring in sport training.
3. To find the effectiveness of the program by setting the experiment and adjusting the selection.

Literature Review

1. Badminton contents and techniques

Tian (2010) pointed out in "Sports Training" that badminton is a technology-driven confrontational sport, and training requirements include speed, aggressiveness, comprehensive techniques, footwork, and improving reaction, flexibility, endurance, and explosiveness. In terms of technology, players are required to have comprehensive, flexible, and delicate techniques, and the landing points must be fierce and unpredictable while focusing on offensive and defensive conversion techniques. In terms of footwork, it is required to be fast, coherent, reasonable, flexible, and coordinated. The Chinese badminton style emphasizes speed, fierceness, accuracy, and flexibility. In the game, both sides compete for the initiative and need to play to their advantage to limit their opponents.

2. Factors affecting the badminton players' performance

Fang (2014) Technical training is crucial in skill-oriented sports, especially in technical events and the early stages of children's training. Psychological and motor intelligence cannot be ignored in the composition of the competitive ability of an excellent sport.

Yu & Zhao (2012) The difference between high-level athletes is often affected by psychological ability, and the motor intelligence of athletes can affect the use of competition tactics and the reading ability of senior players.

Yu & Zhao (2012) For an excellent badminton player, a reasonable lifestyle is essential.

Yang et al (2011) systematically summarized that badminton tactics are an important factor affecting badminton performance.

3. Principals and techniques of badminton training

Tian (2010) summarized:1. Competition principle2.Motivation principle3.Effective control principle4.Systematic training principle5.Periodic arrangement principle6.Appropriate load principle7.Differentiation principle8.Intuitive coaching principle 9. Timely recovery principle

4. Principles and techniques of physical fitness and sport

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The research of Zhou & Ma (2023) showed that core strength training has a significant effect on the training effect of badminton players.

Wang (2021) summarized the research results and found that special speed training effectively improved the special speed ability of young male badminton players.

Liu's (2020) study showed that the combination of multi-directional movement training and traditional training can significantly improve the speed and sensitivity qualities of students in the general badminton class of physical education majors.

The research of Huang (2007) can be summarized as follows: Endurance training methods have a positive impact on improving the endurance quality of badminton students in sports colleges.

5. Training program development principles and techniques

Tian (2010) proposed that the main basis for formulating training plans include: 1. Objective laws of training: refers to the inevitable development trends and internal connections in the training process, such as the continuity and stage of training, the adaptability of the athlete's body, etc. 2. The athlete's starting state: The training plan should be based on the athlete's actual level to ensure that it can effectively improve the competitive ability and conform to the laws of physical development. 3. Training goals: The training plan needs to clarify the goals and design the best path to achieve the continuous development of the athlete's competitive ability. 4. Objective conditions of training: including training facilities, equipment, nutrition and recovery conditions, etc. These material foundations are crucial to training activities. In summary, these factors must be considered when formulating a training plan to ensure the training effect.

6. Research related

Wang (2020) emphasized in the cultivation of "ball sense" that "ball sense" is a long training, but it is not eternal and will weaken or even fade with the influence of emotional tension, long lack of professional training, and physical discomfort. However, as a sign of a competitive state, teenagers should pay attention to "ball sense" training to lay a good foundation for improving sports technical level.

7. Summary

After extensive research on literature and books, this study concluded that the factors that affect badminton performance are: physical fitness, skills, tactical ability, psychological ability, warm-up, injuries, lifestyle, badminton equipment, and competition rules. Physical fitness includes strength, speed, endurance, and agility. Skills include frontcourt skills, midfield techniques, backcourt techniques, backhand techniques, and footwork. Tactics include singles tactics and doubles tactics.

Conceptual Framework

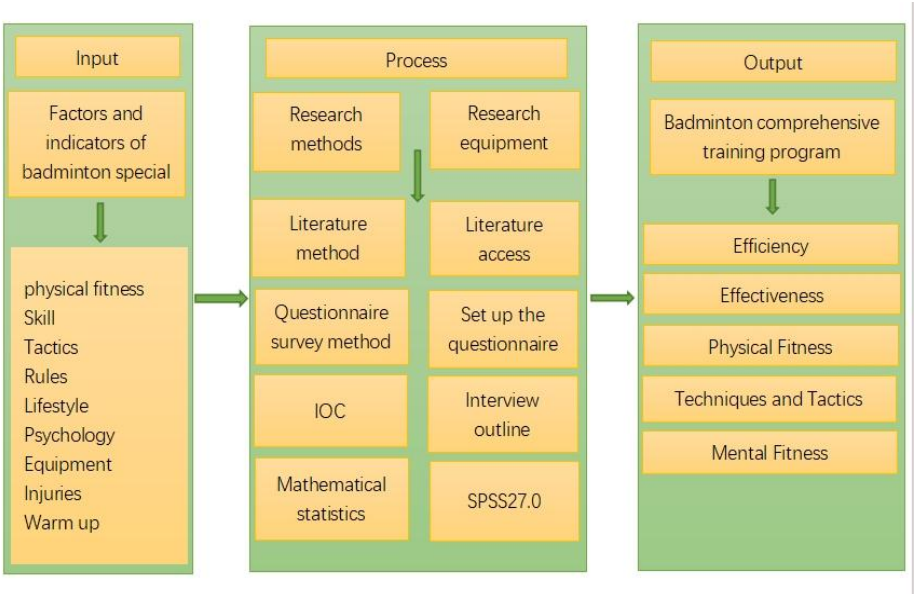

Figure 1 Conceptual Framework

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Methodology

1. Population

A total of 200 badminton students from the sophomore, junior, and senior years of sports training major at Xi'an Physical Education University were recruited, and 60 badminton students were recruited, including 30 males and 30 females. They all have basic knowledge and experience in badminton and do not have any major injuries.

2. Sample

Among the 60 badminton students recruited, G*power3.1 was used to analyze the sample size, and the preset effect size was 0.7, the preset statistical test 1-β=0.8, and the significance level was 0.05 (Cohen, 1998). After calculation, a sample size of 40 people was required, and 40 people were divided into a control group and an experimental group. The control group consisted of 20 people, and the experimental group consisted of 20 people.

3. Research participants

This study used the snowball sampling techniques to select 21 expert professors to provide support for the research.

4. The process of dividing experimental objects into groups

(1) The researchers asked 60 badminton students to take a badminton high-throw test and the referees scored them.

(2) The scores were counted and ranked from low to high, and 40 badminton students were selected.

(3) The 40 badminton students were divided into two groups using a systematic sampling technique with 20 students in each group.

(4) Student representatives were selected by drawing lots and divided into a control group and an experimental group.

5. Research instruments

(1) The comprehensive badminton training program

(2) Expert Questionnaire.

(3) Physical Fitness Test. "Physical Fitness Test Methods and Scoring Standards for Youth Badminton Athletes" (Liu, 2020)

(4) Badminton Skills Test. "Technical Assessment Methods and Scoring Requirements for National Youth Badminton Competition Athletes"(Xiao, 2005)

(5) Psychological Test. "Brief Mood State Scale POMS"(Zhu,1995)

6. Data collection

1. Through questionnaires and interviews with experts, we collected what parts the comprehensive badminton training plan consists of.

2. Collect the specific details of each part of the comprehensive badminton training plan through questionnaires and interviews with experts.

3. The final badminton comprehensive training program was obtained through the Delphi method.

4. The comprehensive badminton training program was tried out by nine badminton-specialized students and the results were obtained.

5. Obtain data through the final experiment.

7. Data analysis

This study mainly uses EXCEL to enter the data obtained from statistical collection and uses SPSS27.0 to conduct descriptive statistics and ANOVA analysis of the data.

8. Research process

Step 1: Through a questionnaire survey of experts, it is clarified which parts a comprehensive badminton training program should include and what the contents of each part should be.

Step 2:Combined with the opinions and suggestions of experts, and then used the literature and books to summarize and organize a comprehensive badminton training program.

Step 3 Using the Delphi method to test the comprehensive training program of badminton.

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Step 4:9 badminton majors were randomly recruited to try out this comprehensive badminton program, and then their performance before and after the experiment was compared.

Step 5 The experiment officially began, with the participants being divided into an experimental group and a control group for a total of 24 weeks, with two training sessions per week each training session lasting 120 minutes. The experimental group used a comprehensive badminton training program, while the control group used the traditional training content of Xi'an Physical Education University.

Results

1. Through extensive references to literature, books, and other materials, as well as questionnaire surveys of experts and the Delphi method, this study summarizes and sorts out the factors that affect the badminton performance of badminton students majoring in sports training at Xi'an Physical Education University: physical fitness, skills, tactical ability, psychological ability, and warm-up conditions. Based on these five factors, a comprehensive badminton training program was constructed. As shown in Table 1.

Table 1 Comprehensive training program for badminton

	Comprehensive training program for badminton
Warm-up	1. Wake up the wrist 2. Wake up the knee joint 3. Wake up the ankle joint 4. Jumping jacks 5. Static stretching for the whole body
Skill	Frontcourt skills：1. Spin net shot 2. Cross net shot 3.Net kill 4. Rush shot Midfield skills:1. Drive 2. Block 3. Flick serves Backcourt skills:1. Clear 2. Drop 3. Smash Backhand skills：1. Backhand serve 2. Backhand clear 3. Backhand block Footwork:1. Stride 2. Shuffle step 3. Jab step
Tactics	Singles tactics：1. Four corners' tactics 2. Diagonal tactics 3. Smash and drop tactics Doubles tactics：1. Attack middle tactics 2. Backcourt attack and frontcourt blocking tactics 3. Attacking people tactics
Physical Fitness	Strength： Upper body strength：1. Swinging a tennis racket quickly 2. Hold the dumbbells and do the swing movement 3. Hold the dumbbells and do wrist rotations 4. Double swing skipping rope Lower body strength：1. Cross lunge jump 2. Barbell calf raises 3. Throw the ball back and forth between your feet Trunk strength：1. Medicine ball pass 2. Plate support Speed： Reaction speed：1. See signal quick start 2. Cover the net and return the ball quickly Displacement speed：1. Training footwork in the sand pit 2.30m shuttle run Endurance：1.1000m run Sensitive： Basic sensitivity：1. Rope ladder run Special sensitivity：1. Twisting the racket with fingers
Psychology	1. "Ball sense" training: Juggling Practice 2. Action reaction training: Two-on-one practice、Shot receiving practice 3. Pay attention to concentration training: Serve and receive in a set order to form a fixed pattern 4. Willpower training: "Reverse" training

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	Comprehensive training program for badminton
	5. Stress management training: Breathing relaxation method, self-suggestion relaxation method
Guidance method	Explanation, Demonstration
Training equipment	Badminton racket, Tennis racket, Medicine ball, Barbell, Dumbbell, Stopwatch, Rope ladder, Jump rope
Total training time	120min

2. By setting up experiments, it was found that the comprehensive badminton training program has a significant impact on the physical fitness, skills, tactical ability, and psychological ability of badminton students majoring in sports training at Xi'an Physical Education University. As shown in Table 2.

Table 2 Mean values, standard deviations, and ANOVA analysis of each test in the experimental group (n=20)

Test items	Pre-test		Mid-test		Post-test		P
	$\bar{x}$	SD.	$\bar{x}$	SD.	$\bar{x}$	SD.	
1. Badminton skills test	74.75	4.494	79.30	4.378	88.15	4.171	.001*
2. Mental ability test	125.30	5.182	120.10	4.941	111.55	5.987	.001*
3. Upper limb strength test	66.00	4.168	79.75	4.723	94.75	4.723	.001*
4. Lower extremity strength test	65.50	4.261	79.75	4.723	90.00	5.849	.001*
5. Trunk strength test	64.75	4.435	78.75	4.253	85.50	3.591	.001*
6. Displacement speed test	65.50	4.261	74.25	4.375	86.00	4.168	.001*
7. Reaction speed test	64.75	4.128	75.75	6.129	86.50	4.617	.001*
8. Basic sensitivity test	65.50	4.261	77.75	4.435	86.75	5.447	.001*
9. Special sensitivity test	63.50	4.007	73.50	3.663	83.75	3.582	.001*
10. Endurance test	65.00	3.974	74.00	5.982	84.25	5.684	.001*

*p<.05

3. And by setting up experiments, it was found that the original traditional training program of the sports training major of Xi'an Physical Education University had no significant effect on the physical fitness, skills, tactical ability, and psychological ability of badminton students. As shown in Table 3.

Table 3 Mean values, standard deviations, and ANOVA analysis of each test in the control group (n=20)

Test items	Pre-test		Mid-test		Post-test		P
	$\bar{x}$	SD.	$\bar{x}$	SD.	$\bar{x}$	SD.	
1. Badminton skills test	74.60	4.057	74.75	3.932	74.85	4.095	.981
2. Mental ability test	125.60	7.639	125.65	7.775	125.50	7.797	.998
3. Upper limb strength test	64.75	4.435	65.50	4.560	66.25	4.833	.592
4. Lower extremity strength test	65.25	4.435	65.75	4.375	66.75	4.064	.535
5. Trunk strength test	65.25	4.435	66.25	4.833	67.00	5.231	.522
6. Displacement speed test	65.25	4.128	66.25	3.582	66.75	4.064	.475
7. Reaction speed test	65.00	3.974	65.50	4.261	66.50	4.007	.501
8. Basic sensitivity test	65.25	4.128	65.50	3.940	65.75	3.726	.923
9. Special sensitivity test	65.00	3.974	65.50	3.940	66.00	4.168	.736
10. Endurance test	64.50	3.940	64.75	4.435	65.75	4.375	.619

*p<.05

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Discussion

To construct an effective badminton comprehensive training program, it is the first task to clarify the factors that affect badminton performance. Secondly, the factors suitable for constructing a training program should be selected from the influencing factors to determine the dimensions and content of the training program. Physical fitness is the foundation of badminton and any sports, the key factor to improve sports performance and sports performance, and an indispensable part of sports training. This view is consistent with Tian (2010). Skills also play a vital role in badminton training. It is an important factor for badminton players to succeed in the game. Skilled badminton skills can enable badminton players to succeed better in the game, strengthen their competitiveness, and achieve the ultimate goal. This view and concept are also consistent with Xiao (2005). Tactics are the countermeasures that badminton players take to win the game, give full play to their competitive level, and take according to the characteristics of their opponents. The correct use of tactics and timely seizing opportunities are extremely important for winning the game. This view is also consistent with Xiao (2005). The relationship between the psychological ability of badminton participants and their training is a two-way relationship, that is, the psychological development level of participants and the psychological promotion function of badminton training are closely related, interdependent, and interactive, so the training of psychological ability is also indispensable and cannot be ignored. This view is consistent with that of Sun (2012). Warm-up is an important part of badminton and any sport. A warm-up helps athletes prevent injuries, improve sports performance, activate muscle groups, increase heart rate, improve breathing efficiency, etc., so the warm-up part of complete badminton training cannot be ignored. Sun (2012) also expressed the same view.

Recommendation

1. Application of research results

Provide reference value for clarifying the factors affecting badminton performance.

Provide training guidance and a basis for improving badminton performance.

Provide a theoretical basis for building and formulating new comprehensive badminton training programs.

2. Recommendation for future study

It is recommended to try out a comprehensive badminton training program to improve the badminton level and performance of badminton students.

It is recommended to refer to the comprehensive badminton training program based on the original traditional badminton training program to enrich the content of the training program.

It is recommended to explore more factors affecting badminton performance, to build a more advanced, comprehensive, and effective comprehensive badminton training program.

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