THE EFFECTS OF LOWER LIMB STRENGTH AND AGILITY TRAINING PROGRAM ON THE LEG POWER AND AGILITY OF BADMINTON PLAYERS

He Jianping

Faculty of Education, Thailand National Sports University Chon Buri Campus

Abstract

The purpose of this study was to perform lower limb strength and agility training for improving the leg power and agility of badminton players. The experimental samples were 20 athletes of the men's team of the Chinese Qujing Normal University badminton team. It was one group pre-test post-test design, the test results of each sample of the experimental group before and after the 8 week experiment were analyzed and compared. The experimental time was controlled from April to June 2019. The experiment lasted 8 week, 3 lessons per week (Monday, Wednesday, and Friday), and 90 minutes per lesson. The researcher used a paired- sample t-test to compare the standing and long jump (leg power) and 10-meter round-trip (agility) before and after the experiment, compare mean and standard deviation. The statistical significance was set to the .01 level. The results were as follows: The sample t-test before and after the 8 weeks of the standing long jump increased by 7.95 cm, and the t-test was significantly different at the 0.01. The sample t-test before and after the 8 weeks of the 10- meter round-trip became 0.465 seconds faster; moreover, the t-test was significantly different at the 0.01. Therefore, lower limb strength and agility training programs can improve the leg power and agility of badminton players.

Keywords: lower limb strength, agility, leg power, badminton

Corresponding Author: Mr.He Jianping, Faculty of Education, Thailand National Sports University, Chon Buri Campus Email: 1402964449@qq.com

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Introduction

Badminton is one of the sports in Olympic Games and is increasingly popular with the masses. As the modern badminton training method becomes more and more scientific, the competition becomes more and more fierce, and the returning speed is getting faster and faster, which puts higher requirements on the strength and speed of the athletes. In order to win the game, it is necessary to increase the speed of the athletes. Power is the foundation of speed. Agility is also important, which determines the speed at which athletes react (Shi, 2010, p. 48). Badminton players are highly sensitive to the reaction, and the flexible and fast footwork is one of the important factors for athletes to win in the competition. The speed of the footwork depends on the speed of the reaction and the strength of the lower limb muscles. Whether the speed of the badminton player can be improved, first of all, you must master the training of reaction ability. The speed of the athlete's nervous system reflex process directly affects the speed of the rhythm. Agility is a prerequisite for increasing the pace of the footwork. Fast and accurate footwork on the athlete's field must have good lower limb strength and agility. Developing lower limb strength is very important to speed up the pace. (Xie & Zhuang, 2009, p. 112). From the current point of view, the teaching level and ability of Chinese university badminton teachers are insufficient. In badminton training, they are still at the level of interpretation, demonstration, practice, correction and summarization. Some new sports training theories and training methods are unacceptable and remain skeptical. In badminton training, training is simple, traditional monotonous, unable to develop a scientific training program, monotonous and repeated technical training in long-term training. (Lu, 2017, pp. 10-11).

The researcher visited the badminton team of Qujing Normal University. The athletes said that the footwork was not in place**,** and the starting position was slow and the movement was not fast. The reason is that the athlete's lower limb strength is insufficient, the agility is poor, and the technical movement is unreasonable. This is because there is not enough lower limb strength training in routine training, as well as no scientific and reasonable training plan, and the quality of agility is not paid enough attention. Therefore, the researcher hopes to help the men's team of the Qujing Normal University badminton team to improve the strength and agility of the lower limbs, and to develop scientific and targeted lower limb strength and agility training programs.

Above, they concluded that badminton is one of the Olympic Games sports and is increasingly popular with the masses. Lower limb strength and agility are the foundation and very important. Lower limb strength and agility are keys to improve the rhythm of badminton players. In the training of most Chinese university badminton teams, the teaching level and training guidance ability of college badminton teachers are limited, and it is impossible to formulate a scientific training plan. The training method is simple and traditionally monotonous. This has become an obstacle to improve the ability of college badminton players to compete. The Qujing Normal University badminton

team has no scientific and reasonable training plan, which leads to the lower limb strength and agility of the athletes, which affects the speed of the footwork. Therefore, the author specially developed a training program for the lower limb strength and agility of the men's team of the Qujing Normal University badminton team, hoping to improve the lower limb strength and agility of the men's team of the Qujing Normal University badminton team.

Research objective

To study the effect of lower limb strength and agility training program of badminton players of Qujing Normal University.

Research hypothesis

Lower limb strength and agility training program can improve leg power and agility of badminton players of Qujing Normal University.

Research variable

Independent variable

Badminton players' lower limb strength and agility program.

Dependent variable

Badminton players' leg power and agility.

Research sample

Samples were 20 players of the men's team of the badminton team of Qujing Normal University.

Research methods

1. Literature review

The researcher went to the Qujing Normal University Library and the Yunnan Normal University Library to inquire about a large number of books on the leg power and agility, as well as training methods on the leg power and agility of badminton players. Meanwhile to CNKI (China National Knowledge Infrastructure) and the China Sports General Administration website to access a large number of master's and doctoral thesis as well as a large number of magazines and journals. According to research needs, the researcher collected and summarized the training methods, means and indicators of badminton leg power and agility, and provided theoretical basis and basis for this paper.

2. Expert interview

In order to ensure the validity of the training program of this study, the researcher sent training plans and research contents to five experts from Thailand and China. The names of the three experts in Thailand were: 1. Asst. Prof. Wipoj Chansam, Ph.D., 2. Asst. Prof. Tavorn Kamutsri, Ph.D., and 3. Asst. Prof. Sumran Sreesung, Ph.D., the two experts in China were: 1. Assoc. Prof. Wang Hao, and 2. Badminton professional coach Wang Deping. The IOC to test the effectiveness of the training

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program, the validity value of 1-2 week training program was 0.846, the validity value of 3-4 week training program was 0.907, the validity value of 5-6 week training program was 0.876, the validity value of 7-8 week training program was 0.823, which proved that the training program of this study can be used, and five experts have proposed changes to the training of researcher. The researcher prepared a comprehensive review of the five experts and finalized the final training plan.

Research tools

The tools the researcher used in this study:

1. Standing long jump tester

From the front of the experiment, the reliability of the standing long-range tester is required. Intra-group correlation coefficient analysis is performed to measure and evaluate the reliability between observers. The full name is the intra-group correlation coefficient (ICC is equal to the individual's variability divided by the total variability, so its value is between 0 and 1.0 means untrustworthy, 1 means completely credible. It is generally considered that the reliability factor which is lower than 0.4 indicates poor reliability, but if greater than 0.75 means good reliability.) The clone Bah value detected by the standing long jump tester before this experiment was 0.898. It was greater than 0.75.

1.1 Stopwatch

From the front of the experiment, the reliability of the stopwatch is required. Intra-group correlation coefficient analysis is performed to measure and evaluate the reliability between observers. The full name is the intra-group correlation coefficient (ICC is equal to the individual's variability divided by the total variability, so its value is between 0 and 1. 0 means untrustworthy, 1 means completely credible. It is generally considered that the reliability factor which is lower than 0.4 indicates poor reliability, but if greater than 0.75, it means good reliability.) The clone Bah value detected by the Stopwatch before this experiment was 0.915. It was greater than 0.75.

Tools used to collect data

Test record form Standing long jump test and 10 meter round trip test.

Data collection

1. Select 20 athletes from the men's team of the Qujing Normal University badminton team as an experimental sample. The team had a total of 20 male athletes.

2. Explain and demonstrate the full training content of the training program.

3. Pre-test the samples before the experiment, the test content: Standing long jump (leg power), 10 meters round-trip (agility), and record.

4. Start the experimental lower limb strength and agility training program to train the samples for 8 weeks, three lessons per week, Monday, Wednesday, and Friday, 16:30-18:00, hrs.

5. At the end of the 8th week, test the samples after the experiment, set the long jump (leg power), 10 meter round-trip (agility), and record.

Data Analysis

Statistical analysis was performed on the data obtained before and after the experiment by computer statistical software SPSS.

1. Find the mean and standard deviation of the analysis results for lower limb strength and agility.

2. Comparative analysis of lower limb strength and agility. There were a significant difference after the experiment.

3. Check whether the leg strength and agility of the experimental group after the experiment were significantly different from those before the experiment, and test the significance of the 0.01 level. Whether the experimental group's standing long jump and 10 meters round-trip experiment were significantly different from before the experiment, the researcher's leg strength and agility training program can improve the leg strength and agility of the badminton player

Research results

Comparison of the pre-test and the post-test of standing long jump and 10 meter round trip after the eight-week training.

Item	Pre-test		Post-test		Mean	t	Sig. (2-tailed)
	$\bar{X}$	S.D	$\bar{X}$	S.D			
Standing long jump	264.50	7.47	272.45	6.60	-7.95	-8.29	.000
10 maters round trip	4.91	0.26	4.45	0.21	0.63	15.27	.000

The table shows that the pre-test mean score for standing long jump was 264.500 cm, and the mean score for the post test was 272.450 cm, the t-test value was -8.296, and the p-value was 0.000, which was less than 0.001, indicating that the badminton players' performance in standing long jump eight weeks before and after was significantly different at 0.01 level.

The table shows that the pre-test mean score for a 10-meter round-trip was 4.917 seconds, and the mean score for the post-test was 4.452 seconds, a difference of 0.631 seconds. The t-value was 15.276, and the p-value was 0.000, which was less than 0.001, indicating that the badminton player's 10-meter round-trip eight weeks before and after was significantly differenct at 0.01 level.

Discussions

The purpose of this study was to study the effects of lower limb strength and agility training programs on the strength and agility of badminton players' legs. Results were indicated that the badminton players' performance in leg power eight weeks before and after was significantly different at 0.01 level. Meanwhile the badminton player's 10-meter round-trip eight weeks before and after was significantly differenct at 0.01 level. It can be concluded that lower limb strength and agility training programs can improve the leg power and agility of badminton players.

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The results of this research were found in accordance with many researches. The first one (Liu, 2018, p. 193) is athlete strength analysis training methods and considerations. Research objective was to analyze the main factors affecting strength, training methods and training considerations.

It was found that as a comprehensive ability of human strength, strength was the strength of maximum muscle tension in a very short time under the condition of overcoming certain resistance. Power = Fmax / t. The factor that determined strength was muscle contraction time. According to the Hill equation, the maximum muscle tone, distance and speed of the muscle were inversely proportional to muscle tone and muscle contraction rate. At the same force distance, the force depended on the best combination of muscle strength and contraction speed.

The second one (Tao, 2018, pp. 165-166) was the research on the strength training of badminton players agreeing that muscle strength which was improved can promote power. The research objective: was to study the training methods and influencing factors of badminton players' strength.

It was found that power depended to a large extent on two important conditions: -1) the strength of muscle contraction, and 2) the rate at which muscles contracted. Power was expressed by the formula: power = intensity x speed, as can be seen from the expression: Muscle contraction and contraction speed both affected strength. That was to say, the increase in strength can be trained from two aspects of improving muscle strength and muscle contraction speed. One of the factors was improved. It can increase power.

The third one (Zhao, 2007, pp. 123-124) was analysis of factors affecting power, agreeing that power was the foundation of strength. Improving strength can promote the improvement of power.

The research objective was to analyze the factors affecting the development of strength and provide a theoretical basis for sports training.

If was found that the size and scope of power played a key role in mastering and completing some sports. Power included strength and speed: power = strength and speed. It can also be expressed as: power = strength x speed / time. Strength depended on the combination of strength and speed. In power projects, if the resistance to be overcome was small, the speed should be increased. If you need to overcome resistance, you need to rely more on strength.

The fourth one (Wu, 2018, p. 4) was experimental research on the influence of rope ladder training on the agile quality of badminton special students. He agreed to use the 10-meter round-trip to test and evaluate the athlete's agility.

The research objective was to study the influence of rope ladder training on the agile quality of badminton special students and compare the rope ladder training method with the traditional agile quality training method.

It was found that after the experiment, the experimental group and the control group were tested for agility: T-run, badminton six-point step, round-trip 10 meters, midfield killing, quadrant jumping. Analyze experimental data before and after the experiment. The agility of the experimental and control athletes was significantly improved. The special athletic ability of badminton was based on a special agility. Based on non-special agility, traditional physical training methods mainly

affected athletes' non-specific agility. Rope ladder training can further enhance the special agility of badminton players.

The fifth one (Cheng, 2016, p. 30) was experimental study on the influence of trapezoidal training method on the agile quality of badminton special students.

The research objective was to study the influence of ladder training method on the agile quality of badminton special students.

It was found that the badminton team's agility quality requirements were very special, because the badminton competition was a rhythmic and extremely fast sport, requiring athletes to quickly adjust the movement and rhythm according to the situation and opponents. The athletes were asked to take action quickly. Agility, the requirements for special agility were very high. The study used a 10-meter round-trip run to test and evaluate athlete agility. Currently, many studies use a 10 meter round trip to assess the agility of badminton players. Chen Xiuchao found that students using traditional training methods scored on T-run and 10m round-trip projects, indicating that traditional agile training methods also improved agility. However, the combination of traditional training agility training methods and ladder agility training methods improved agility.

The sixth one (Li & Li, 2016, p. 40) was to study the impact of agile quality on the success rate of badminton. He agreed to use the 10-meter round-trip to test and evaluate the athlete's agility.

It was found that targeted training of agile quality improved the performance of the response, and the response time score was inversely proportional to the success rate of badminton capture. For the improved round-trip 10 meters, the round-trip 10 meters score was inversely proportional to the badminton capture success rate, and the T-plane test score was inversely proportional to the badminton capture success rate. A four-week targeted training for sensitive quality increases agility showed that the better the agility, the higher the success rate of badminton capture.

Suggestion

1. Researches recommended

1.1 The study on lower limb strength training and agility training should be added with speed training.

1.2 The study on coordinated training should be carried out before training agile quality, which is more conducive to improve agile quality

1.3 The study on effects of lower limb strength and agility training program on the leg power and agility of male badminton players should be conducted.

2. Utilization

2.1 Qujing Normal University badminton men's team athletes in the daily training should pay attention to fully warm up and stretch muscles before the lower limb strength training.

2.2 Qujing Normal University badminton men's team athletes in the daily training should pay attention to the intermittent time in agile quality training which should not be too long and stay between 30 seconds to 1 minute, to maintain the excitement of athletes.

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2.3 After the athletes have adapted to the current load, they can load or increase the number of practice groups. Qujing Normal University badminton men's team in daily training, when practicing lower limb strength and agility, should pay attention to keeping the movement correct and prevent muscle damage.

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