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Footwork Training Path in Tennis Technique

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Abstract: In modern tennis, more than 70% of lost points are often due to inadequate footwork. As the saying goes, the technique is the foundation, but footwork is the key. Without proper footwork, even the best technique cannot fully exploit competitive advantage. This paper examines the footwork training path in tennis technique, aiming to provide a reference for China's tennis coaches and professional talent training organizations. The goal is to further enhance China's tennis player development system and to produce high-quality tennis athletic talents for the sports world.

Keywords: Tennis technique; Footwork training; Lateral movement; Forward movement; Meter movement

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1. Introduction

Since the first National Games in 1950, China officially recognized tennis as an official sport. Within a short period, provinces and cities across China developed a systematic tennis player cultivation system, achieving notable results in world-class competitions. However, compared to Europe and the United States, China's tennis development started later and faces challenges, including differences in the athletes' physical qualities. There remains a gap between China's tennis training system and those of traditional powerhouses like the United States. Footwork training, a crucial element in tennis, is an area that requires significant attention from Chinese players. Therefore, studying the training paths for tennis footwork is a valuable endeavor to improve China's tennis training system and enhance the technical level of its athletes.

2. The influence of footwork training on tennis players' skills

In competitive tennis, footwork determines whether players can move quickly and efficiently into position for effective shots and tactical execution. Analyzing this further, the impact of footwork training on tennis players' skills includes improved court coverage ability, stroke stability and power, enhanced mental resilience and court presence, and injury prevention.

2.1. Improve athletes' field coverage ability

The tennis court is a large area and during competitive matches, the opponent's strokes may be spread all over

the court in various areas. Excellent footwork enables players to move quickly to the optimal hitting point in a short time to execute a return. Through high-frequency, multi-directional footwork practice, athletes gradually develop the ability to move swiftly and position accurately, enabling them to better adapt to different tactical changes of opponents in competitive matches.

2.2. Improve the stability and power of hitting

Good footwork will improve the stability and power of the athlete's stroke. Reasonable footwork can ensure that the athlete's posture and center of gravity are highly stable at the moment of hitting the ball and enhance the strength of hitting the ball through the smooth movement of the body. The coordination of footwork and body posture can maximize the muscle strength and joint flexibility of the player so that every shot has more power and accuracy.

2.3. Enhancement of psychological quality and field adaptability

Footwork training has the effect of improving the athletes' psychological quality and field adaptability. In the process of high-intensity footwork training, athletes need to deal with rapidly changing movements and directions, hence long-term training will improve athletes' reaction speed and instantaneous judgment. This kind of demanding footwork contact can not only enhance athletes' physical fitness but also effectively refine their psychological quality so that they always maintain a confident and calm mindset in a high-pressure competitive environment [1].

3. Research object and pre-test data

3.1. Research object

This study involved 40 athletes from the tennis department of a sports center, consisting of 20 males and 20 females, all of whom have been engaged in tennis training for over a year. Before the experiment, the athletes were tested on their footwork skills, including forward-moving strokes, lateral-moving strokes, and metric footwork movements.

Firstly, specialized coaches administered a test where they sent 20 balls to the athletes in four different directions from a fixed point. The athletes were required to use forward, lateral, and backward footwork during the stroke, and the coaches recorded the number of balls hit within the boundaries.

Secondly, the 5 m return run and meter-fixed route exercises were timed, and technical scoring was applied to evaluate the footwork during various movement phases. This was done to assess the appropriateness of different footwork techniques used by the athletes in various directions.

Finally, a meter-fixed route movement time test was conducted to analyze the athletes' proficiency in applying different footwork techniques. The scoring was carried out by professional athletes from sports schools.

In terms of statistical methods, the scores of the three kinds of footwork were counted, and the score was "+1" given if the ball was hit within the boundary during movement. The athletes' footwork scores were documented in a table, and the time taken for the meter-fixed route movement was recorded. After collecting the raw data, Microsoft Excel and Statistical Package for the Social Sciences (SPSS25.0) were used for data analysis and processing to obtain accurate statistical results.

3.2. Hitting the ball within the boundary test while moving

Table 1 shows the statistics of the results of the 40 research subjects' pre-experimental hitting within boundary

while moving test:

Table 1. Results of hitting the ball within the boundary while moving test ($N = 40$)

Sex	Test indicator	Test results
Male ($N = 20$)	Forward movement	6.35 ± 2.33
	Lateral movement	6.12 ± 1.83
	Backward movement	6.05 ± 1.65
Female ($N = 20$)	Forward movement	5.62 ± 2.22
	Lateral movement	5.12 ± 1.83
	Backward movement	6.02 ± 1.63

During the test, the coach and the athlete worked in pairs, with the coach sending a ball near the net and another high ball to the backcourt. The athlete needed to move back and forth to hit the ball at the net and the baseline. Based on the pre-test in **Table 1**, it can observed that in the forward movement hitting test, the scores for male and female athletes were 6.35 and 5.62, respectively. In the side-to-side movement hitting pre-test, the scores were 6.12 for males and 5.12 for females, while in the backward movement hitting pre-test, the scores were 6.05 for males and 6.02 for females.

3.3. Evaluation of the application of three footwork techniques

Table 2 shows the pre-test data of the rationality of three types of footwork.

Table 2. The results of the rationality of three types of footwork test ($N = 40$)

Sex	Test indicator	Test results
Male ($N = 20$)	Forward movement	7.52 ± 0.32
	Lateral movement	7.05 ± 0.33
	Backward movement	7.88 ± 0.47
Female ($N = 20$)	Forward movement	8.12 ± 0.42
	Lateral movement	7.03 ± 0.22
	Backward movement	8.02 ± 0.41

The rationality of the athletes' footwork was assessed by two professional athletes from the School of Physical Education. During the assessment, the reasonableness, accuracy, and consistency of the footwork used by the athletes during movement were evaluated using a 10-point system. The main aspects observed included running, sliding, padding, cross-stepping, crunching, jumping, and other tennis footwork techniques.

3.4. Meter movement time test

A comparison of the time taken for a fixed-route movement over a distance of one meter was conducted with 40 athletes. The statistical results of the pre-test are shown in **Table 3**.

Table 3. Results of meter-fixed movement time test ($N = 40$)

Sex	Test indicator	Test results
Male ($N = 20$)	Traveling time	75.86 ± 3.18
Female ($N = 20$)	Traveling time	72.55 ± 5.97

Based on the results of **Table 3**, it can be concluded that the average time for completing the fixed-route movement is 75.86 s for male athletes and 79.55 s for female athletes.

4. Training path

This study proposes a training path focusing on basic physical quality development for athletes, including lateral, forward, backward, and forward-backward step movements, to enhance their overall footwork ability.

4.1. Basic physical quality training

The basic physical quality aims to improve the sensitivity and speed quality of tennis players during various footwork use.

4.1.1. Sensitivity training

Sensitivity training includes two forms: rope ladder training and rubber band reaction training. During the rope ladder training, the coach lays out the ladder on the ground, and athletes use various steps (such as single-legged jumps and crossover steps) to quickly traverse the ladder, focusing on speed and accuracy. In the rubber band reaction training, the coach attaches a tennis ball to one end of a rubber band. The athlete stands in a fixed position and uses their hands or feet to quickly respond to the sudden changes in the rubber band's direction.

4.1.2. Speed quality training

Speed quality training includes sprinting and shuttle running. In the sprinting and starting training, athletes perform short-distance sprints ranging from 30 m to 50 m, with a focus on starting response and initial acceleration. High-intensity sprints are conducted in intervals to improve explosive power. For shuttle running training, coaches set up multiple markers on the field, spaced 5 m to 10 m apart. Athletes run quickly and change direction rapidly within the designated path to cover the specified distance [2].

4.2. Lateral movement footwork training

Lateral movement footwork practice includes two types of exercises: lateral movement with a ball and lateral movement without a ball. Lateral movement without a ball includes using side-sliding steps and obstacle side step exercises designed to enhance coordination and speed in basic footwork. During training, two markers were set up 5.0 m apart. Athletes moved quickly between the markers using side-sliding steps, maintaining a low center of gravity and slight knee bend to ensure consistent movement and footwork. The training consisted of 3 sets of 10 round trips each. For the obstacle side step exercise, cones were placed as obstacles in a zigzag pattern on the field. Athletes navigated around each cone, focusing on maintaining footwork continuity and stability.

Lateral movement with a ball focuses on using lateral movement to hit the ball, combining lateral movement simulation with quick direction changes. During lateral movement hitting, the coach threw the ball from various positions while athletes moved sideways to hit it. After each hit, athletes quickly returned to the

ready position for the next hit. Training involved 10 strokes per set, with 4 sets in total. Lateral movement simulation involved continuous left and right movements while hitting the ball, maintaining ball quality under high intensity. This training lasted 5 minutes per set, with 3 sets in total. For the lateral quick change of direction exercise, the coach directed athletes to move sideways and hit the ball based on random instructions, requiring quick responses to execute the corresponding movements. Training involved 10 direction changes per set, with 3 sets in total [3].

4.3. Forward movement step training

Forward movement step training includes sprint running inspired by football practice. During the training, the coach held a tennis ball at the penalty line and the players were positioned at the baseline. When the coach dropped the ball from shoulder height, the athletes sprinted forward to catch it. Athletes were required to catch the ball 5 times each in front, to the right front, and to the left front. Additionally, the training included 50 m sprints with a racket, with each session consisting of 3 sets, with 3 sprints per set.

4.4. Backward moving step training

During backward moving step training, the athlete stood in the middle of the serving line on the tennis court, holding a tennis ball. The trainer placed one tennis ball each at the left foot, right foot, and baseline focus. The athlete then moved backward, using a side step to the left foot to exchange the tennis ball with the one on the ground. Next, the athlete moved to the right foot to exchange the tennis ball again, then to the midpoint of the baseline to exchange the tennis ball with an adjusting step, and finally returned to the starting point. This completes one set of the exercise. The training is performed in 3 sets each time.

4.5. Comprehensive training of forward and backward moving steps

In the comprehensive training of forward and backward moving steps, coaches and athletes start by facing each other. The coaches send balls to the front of the net and retrieve high balls from the backcourt. Athletes must move quickly back and forth between the net and the baseline to hit the ball. During this period, athletes are required to use the cross-running method [4].

5. Analysis of test results

After 40 athletes completed a two-month training program based on this regimen, their ability to hit the ball within the boundaries, the rationality of their use of the three types of mobile footwork, and their performance in the metric movement were tested. The results are shown in **Table 4** to **Table 6**.

Table 4. Test results of hitting the ball within boundary while moving before and after the experiment ($N = 40$)

Sex	Test indicator	Pre-test results	Post-test results	*p*-value
Male ($N = 20$)	Forward movement	6.35 ± 2.33	7.68 ± 1.12	0.0312
	Lateral movement	6.12 ± 1.83	8.46 ± 1.98	0.0275
	Backward movement	6.05 ± 1.65	7.39 ± 1.12	0.0126
Female ($N = 20$)	Forward movement	5.62 ± 2.22	6.88 ± 1.72	0.0483
	Lateral movement	5.12 ± 1.83	7.53 ± 1.57	0.0076
	Backward movement	6.02 ± 1.63	6.38 ± 1.65	0.0432

Table 5. Rationality test results of the three types of footwork before and after the experiment ($N = 40$)

Sex	Test indicator	Pre-test results	Post-test results	*p*-value
Male ($N = 20$)	Forward movement	7.52 ± 0.32	7.62 ± 0.44	0.0046
	Lateral movement	7.05 ± 0.33	7.48 ± 0.23	0.0125
	Backward movement	7.88 ± 0.47	8.14 ± 0.43	0.0173
Female ($N = 20$)	Forward movement	8.12 ± 0.42	8.56 ± 0.37	0.0018
	Lateral movement	7.03 ± 0.22	7.61 ± 0.22	0.0112
	Backward movement	8.02 ± 0.41	8.21 ± 0.50	0.0132

Table 6. Test results of meter-fixed movement time before and after the experiment (N=40)

Sex	Test indicator	Pre-test results	Post-test results	*p*-value
Male ($N = 20$)	Traveling time	75.86 ± 3.18	71.16 ± 8.23	0.0265
Female ($N = 20$)	Traveling time	79.55 ± 5.97	74.88 ± 3.12	0.0315

Based on the data analysis in **Table 4** to **Table 6**, after a two-month footwork training program following the present protocol, the results showed significant improvement in hitting the ball within the boundary while moving for both 20 male and 20 female athletes. There were notable improvements in forward, lateral, and backward movements ($p < 0.05$). Female athletes showed a particularly significant enhancement in lateral movement, improving from 0.12 to 7.53 ($p < 0.01$). Additionally, the rationality of using the three types of footwork improved significantly for all 40 athletes after the training, especially in the forward movement test, with a very significant difference observed, and the results for male and female athletes were comparable ($p < 0.01$). Finally, the meter-fixed route movement times for both male and female athletes were significantly reduced post-training ($p < 0.05$).

6. Conclusion

Based on the two-month training of 40 tennis players using the proposed footwork training program, it can be concluded that performance in hitting the ball within the boundary while moving, the rationality of using the three types of footwork, and the meter-fixed route movement times were all significantly improved. This demonstrates the feasibility of the training program outlined in this paper. Tennis coaches should emphasize footwork training in their programs and consider using the proposed training program in conjunction with the athletes' specific needs and conditions to enhance their overall competitive level.

Disclosure statement

The author declares no conflict of interest.

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