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Development of a Specific Training Program to Improve Physical Fitness and Side Kick Skill for Female Wushu Sanda Athletes

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Abstract

Background and Aim: At present, female athletes from the Wushu Sanda team of Jiaozuo City, Henan Province, are still weak in physical fitness and the side kick skills, which are the most frequently used and most scored in the competition. So, the main objective of this research was to develop a specific training program to improve physical fitness and side kick skill for female wushu sanda athletes.

Materials and Methods: This research was a quasi-experimental research; The samples were the 44 females from Wushu Sanda teams in Henan Province. The research proceeded with interviewing 5 experts to find the scope draft of the training program, and was confirmed by 9 experts. The developed program was validated with 5 experts with the Index of Item Objective Congruence (IOC) and found of 0.94 and found reliability of 0.85. The two-group pre-test and post-test experimental design was operated for 8 weeks, 3 days a week, 90 minutes per day on Mondays, Wednesdays, and Fridays for the experimental group by the specific training program and Tuesdays and Thursdays by the traditional training program. But the control group was trained by a traditional training program for 5 days. Data analysis with paired t-tests for within groups and independent t-tests for between groups, with a significance level of .05.

Results: 1. The post-test of the experimental group on physical fitness, side kick skills, and FMS tests were significantly better than the pretest in all variables, but in the control group, there was a significant better in all tests except the wall sit test and hurdle step test, which showed no significant difference. 2. The comparison of post-test between the experimental group and the control group showed no significant difference, only for the agility test in the physical fitness test. But on the other physical fitness tests, all FMS and all side kick skills tests in the experimental group were significantly better than in the control group. 3. The confirmation of the specific training program was accepted as appropriate and practical by experts.

Conclusion: The specific training program designed by the researcher was tested for quality by experts and found to be reliable and applicable in the experiment. The experimental results in most of the variables that needed to be developed showed positive improvements and had statistically significant differences.

Keywords: Specific Training Program; Physical Fitness; Wushu Sanda Side Kick Skills; Female Athletes

Introduction

In 2019, the World Health Organization (WHO) recommended that adults engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity each week, along with muscle-strengthening exercises on two or more days. Regular physical activity significantly reduces the risk of chronic diseases, enhances mental health, and promotes overall well-being. For children and adolescents aged 5-17, at least 60 minutes of moderate to vigorous activity daily is advised. Additionally, WHO emphasizes the importance of limiting sedentary behavior to maintain health (Guthold et al., 2019)

Specific training was an approach that improved performance in a specific sport by developing the necessary skills and athletic characteristics (e.g., speed, agility, quickness). Specific Training Program refers to the combination of different types of training methods to improve the multi-faceted ability and adaptability of athletes. The advantage of a Specific Training Program is that it can flexibly adjust the content, intensity, frequency, and duration of training according to the individual differences, training goals, and sports characteristics of athletes, to achieve the best training effect (Loturco et al., 2017).

Wushu Sanda is an important part of China and a national treasure of the Chinese nation. It is a unique fighting program with unique national characteristics and gradual internationalization (Qiu, 2004). Due to the skill characteristics and the requirements of competition rules, Wushu Sanda has a highly competitive, attack and defensive conversion rhythm, fast, diversified, and flexible, so it puts forward high requirements for the coordination ability, balance, and stability of athletes. Therefore,

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applying the physical exercise training methods to Wushu Sanda training will play a positive role in improving the balance ability of Wushu Sanda athletes (Yao, 2008). Side kick is a key part of the skill system of Sanda, which is an essential scoring method in the actual competition. Due to the flexibility, speed, and strength of side kick technology, the utilization rate in Sanda competition is as high as 60%, so the improvement of side kick skills of Sanda players should be paid attention to (Hu, 2009). The side kick skill is frequently used by Wushu Sanda athletes in competitions. It has a good striking effect and a high success rate, so it requires a relatively high physical fitness for Wushu Sanda athletes. In the competition, as the athlete's physical energy consumption decreases, the athlete's skill movements will be deformed, the lethality of the technical movements will decrease, the movement speed will slow down, and the accuracy of the movement will decrease, so it often causes one side's athletes to fall short when they are leading on the field and eventually lose the game. Since Wushu Sanda side kick skills are all performed by athletes with one supporting leg, the side kick skill places higher requirements on Wushu Sanda athletes to maintain their own stability and control ability to complete the technical movements (Sha, 2021).

This paper combines the basic theories of exercise, specific training, and so on with the literature data method, interview method, mathematical statistical analysis method, and experimental method. At present, female athletes from the Wushu Sanda team of Jiaozuo City, Henan Province, are still weak in physical fitness and the side kick skills, which are the most frequently used and most scored in the competition. These factors need to be developed quickly to further raise the competition scores to a higher level. So, 44 female athletes from the Jiaozuo Wushu Sanda team were selected for an 8-week experiment to test the data indicators before and after the experiment, and through the comparative analysis of the data, it was concluded that the physical exercise training had a significant effect on improving the physical fitness and side kick skill of Wushu Sanda athletes.

Objectives

1. To develop a specific training program to improve physical fitness and side kick skill for female Wushu Sanda athletes.
2. To set experiment on the application of a specific training program to improve the physical fitness and side kick skill for female Wushu Sanda athletes.
3. To compare the pre-test and post-test results of physical fitness, side kick skill, and functional movement screen test (FMS) for female Wushu Sanda athletes.

Literature Review

1. Specific fitness for Wushu Sanda

Wushu Sanda demands a well-rounded physical fitness profile. Core strength and lower body power generate explosive force for kicks, jumps, and dynamic movements. Excellent flexibility allows a full range of motion and muscle length for high kicks, splits, and postures. Exceptional static and dynamic balance, proprioception, and body control for precise technique execution during transitions and acrobatic elements. Coordination and agility facilitate seamless complex movement sequences with rapid changes in direction. High levels of aerobic and anaerobic endurance fuel the sustained high-intensity bouts throughout routines. An optimal body composition with increased lean muscle mass enhances power production and muscular endurance. Developing this comprehensive physical preparedness maximizes performance in competitive Wushu Sanda.

The specific physical fitness components for Wushu Sanda can be defined as follows:

1. Muscular Strength and Power:

- Core strength: A strong and stable core is essential for executing and controlling the intricate movements, rotations, and balance requirements in Wushu Sanda.
- Lower body strength and power: Explosive power in the legs is crucial for generating force in kicks, jumps, and dynamic movements.

2. Flexibility:

- Joint mobility: Wushu Sanda involves a wide range of motion and dynamic postures, requiring excellent joint mobility in the hips, shoulders, and spine.

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- Muscle flexibility: Adequate muscle flexibility is crucial for executing high kicks, splits, and maintaining proper technique in various stances and positions.

3. Balance and Proprioception:

- Static balance: The ability to maintain balance and control in static postures and stances is essential for stability and technique execution.
- Dynamic balance: Many Wushu Sanda movements require dynamic balance control during transitions, spins, and acrobatic elements.
- Proprioception: Awareness of body positioning and control in space is crucial for precise technique execution and injury prevention.

4. Coordination and Agility:

- Kinesthetic awareness: The ability to coordinate complex movement patterns and sequences seamlessly is essential for Wushu Sanda performance.
- Foot and body control: Precise foot placement, body positioning, and control are required for executing techniques with accuracy and fluidity.
- Agility: Rapid changes in direction, footwork patterns, and body positioning demand excellent agility and body control.

Training methods for developing strength, power, endurance, flexibility, and agility are essential for athletes and individuals aiming to improve their overall physical fitness. Various training techniques and programs have been studied to determine their effectiveness in enhancing these physical attributes. This synthesis will present key insights from multiple research papers on the most effective training methods for these fitness components (Chtara et al, 2008).

2. Content and practice of the side kick skill in Wushu Sanda.

Side kick in Wushu Sanda is a fast, powerful kick technique that by the rotation of the body and the extension of the legs to produce a strong striking force (Wang, 2007). In Sanda, side kick is usually divided into the following types:

1. Front and rear low side kick: start from the side of the body, kick the leg quickly, kick out from the low point, the target is usually the opponent's leg or below the knee.
2. Front and rear high side kick: from the side of the body, the leg quickly kicks out from high; the target is usually the opponent's head or shoulder.

2.1 The characteristics of the Sanda side kick include:

Quick: The side kick is initiated and recycled very quickly, making it difficult for the opponent to react.

Strength: The side kick can produce a great striking force through the rotation of the body and the extension of the legs.

Flexibility: The side kick can flexibly adjust the direction and height of the kick according to the opponent's position and movement.

Concealed: The initiation action of the side kick is small and not easy to detect by the opponent, which increases the suddenness of the attack.

2.2 Wushu Sanda side kick test.

At present, the domestic research on the side kick mainly focuses on the side kick support leg and the whipping leg. Partly, it mainly involves several kinematic characteristics of the three-motor links of the hip, knee, and ankle.

Yu (2008) believes that the Biomechanical Characteristics of Side kick Technology of Excellent Wushu Sanda Athletes that the knee joints of athletes folding as much as possible to improve the striking effect of Wushu Sanda side kick. At the same time, the active torsion of the athlete's waist helps to improve the speed of the side kick, thus enhancing the striking effect of the side kick movement. The study also pointed out that the characteristics of side kick technology in Wushu Sanda were basically consistent with the movement chain of human joints. Li (2005) will mark points in athletes, according to the calibration of each object joint to expand the corresponding detection, side kick blow effect of synchronous detection, through the corresponding research analysis, said excellent Wushu Sanda athletes' side kick points include kick, delivery, and button, etc.

Through the collation and analysis of relevant literature, the following characteristics of Wushu Sanda side kick technique can be summarized: (1) Wushu Sanda side kick is the most basic

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whipping action, which needs to be completed in the coordination of relevant large and small muscle groups, especially the role of the trunk is particularly important in the training. (2) In the whole lateral kick technique, the main function of the muscles is the left and right rectus femoris and the lateral head of the gastrocnemius, so the attention of these muscle strength training should be improved. (3) Muscle strength is the key to improving the side kick and strike strength of Wushu Sanda athletes. At the same time, according to the sports characteristics of Wushu Sanda sports, it is necessary to focus on training the maximum strength and speed of the athletes. (4) The contribution of knee rotational energy is more than that of the hip joint, and the training of the visual knee muscles should also be strengthened. (5) The active torsion of the supporting leg is conducive to improving the strike strength and movement speed of the striking leg, so the active rolling torsion of the supporting leg should be emphasized in the training.

4. Summary

In the research field of Wushu Sanda, the scholars have made an in-depth analysis of the technology and tactics, explored various training methods, and conducted systematic research on the physical training and side kick skills of the athletes. These studies aim to improve the technical level and competitive state of athletes to achieve excellent results in Sanda competitions at home and abroad. The study of side kick ability mainly focuses on the analysis of the kinematic characteristics of technical movements, and the researchers are committed to finding effective ways to improve the effectiveness of hitting. Through the careful study of the opposite side kick movement, the athletes can better master the side kick skills, to play a greater role in actual combat.

Conceptual Framework

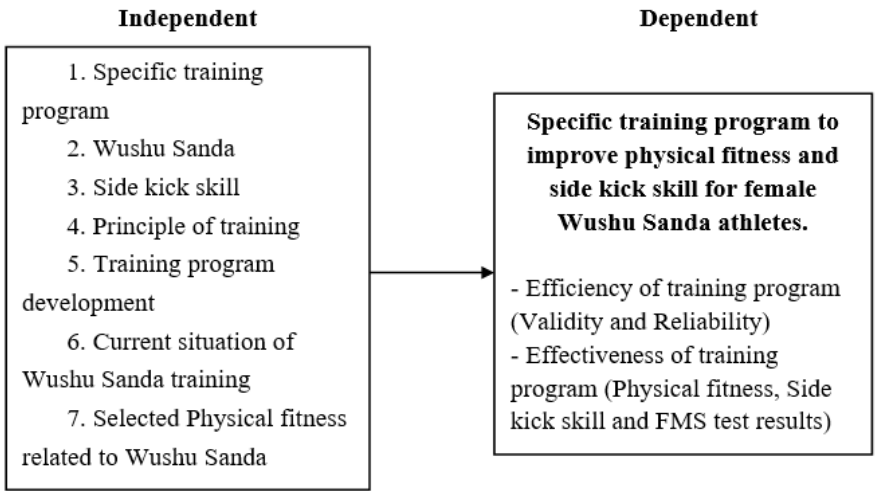

Figure 1 Conceptual Framework

Methodology

Population

The populations of this study are all the female Wushu Sanda athletes in Henan Province. There were 17 Wushu Sanda teams with a total of 623 female Wushu Sanda athletes aged between 15-18 years. Those athletes had a basic Wushu Sanda skill and would be selected as the population of this research.

Sample

The researcher used purposive random sampling to select 44 female Wushu Sanda athletes from the Jiaozuo Team aged 15-18 years. As for Jiaozuo Wushu Sanda Team, the female athletes still need to improve their competition scores and develop their physical fitness because their competition scores are not satisfactory. In this study, the team manager of the Jiaozuo Team agreed to collect data for the study.

Randomization method

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44 female Wushu Sanda athletes were tested for Wushu Sanda Side kick high side on 30 30-second test. And ranked the test scores from highest to lowest, then used a systematic sampling method to divide athletes into two groups with 22 athletes each, and then a random lottery method to determine the experimental group and the control group.

Research Participants

1. 5 experts for interviewing to consult and determine the composition of a specific training program, including: 2 Wushu Sanda coaches, 2 Wushu Sanda referees, and 1 Wushu Sanda team manager.

2. 9 experts for focus group discussion, consultation, and suggestions on the development of a specific training program. The experts consisted of 2 Wushu Sanda coaches, 2 Wushu Sanda referees, 2 Wushu teachers, 2 fitness trainers, and 1 Wushu Sanda team manager.

3. 5 experts conducted an IOC validation of the developed specific training program; this group of experts was: 1 Wushu Sanda coach, 1 Wushu Sanda team manager, 1 Wushu teacher, 1 Wushu Sanda referee, and 1 fitness trainer.

Research Instrument

1. Interview outline: Use the face-to-face and telephone method to interview 5 experts in related fields to consult and determine training methods for improving the muscle group, physical fitness, and fundamental screen (FMS) related to side kick skills.

2. Focus group record form: A group of 9 experts in related fields to provide advice on improving a specific training program.

3. Evaluation form for specific training program: After completing the draft of the physical exercise training program, the researcher would invite 3 experts in related fields to evaluate the validity of the training program.

4. Specific training program: The training program that focuses on developing physical fitness, side kick skill, and FMS test results. The physical fitness in terms of speed, agility, as well as leg and core strength, focuses on developing side-kicking skills in female Wushu Sanda athletes of the Jiaozuo Sanda team. The time range of the experiment was 8 weeks, 3 days per week (Monday, Wednesday, and Friday), 90 minutes per day.

5. Wushu Sanda side kick skill record form: The side kick scoring form consists of two parts: the first part is a personal record of the participants, and the second part is a table recording the frequency of side kicks within 30 seconds. (Wushu Sanda Test Content and Scoring Criteria, 2024)

6. Physical fitness test: The physical fitness test for female Wushu Sanda athletes includes muscle strength, muscle endurance, speed, accuracy, and agility. (China National Physical Fitness Test Standards, 2023)

Muscle strength test: Standing long jump (cm)
Muscle endurance test: Wall sit (second)
Speed test: 50-meter sprint (seconds)
Agility test: T-test (second)

7. Fundamental movement screen test (FMS): Used to assess movement patterns in female Wushu Sanda athletes, including 7 movements of deep squat, hurdle step, inline lunge, shoulder mobility, active straight-leg raise, trunk stability push-up, and rotary stability. 7 functional movement patterns, each scored from 0 to 3, for a total possible score of 21 points.

3 Points: Perfect movement without compensation.
2 Points: Movement with some form of compensation or imperfection.
1 Point: Unable to perform the movement correctly.
0 Points: Pain during the movement.

Individuals who score less than 14 points on the FMS screen have a greater odds for sustaining an injury (Kiesel et al, 2007).

8. Specific training satisfaction evaluation form: After the 8-week experimental period, 22 athletes from the experimental group were asked to rate their satisfaction with the trial participation, which will serve as a baseline for future program development.

Data Collection

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1. Collect and organize existing research results and theoretical frameworks related to the research topic through a systematic review of relevant academic papers, books, conference papers, research reports, and other literature.

2. Conduct face-to-face and telephone method in-depth interviews with experts in the field. The interview content revolves around the research topic and collects experts' insights, experiences, and suggestions on related issues.

3. Organize a group of representative individuals in the field related to the research topic for collective discussion and collect their collective opinions and feedback by the focus group method.

4. The experiment lasted for 8 weeks, with 3 training sessions per week, and each training session lasted 90 minutes per session. The experimental group adopted a specific training program, and the control group used a traditional training program.

5. Basic information such as height, weight, and age was collected, and the first pre-test of side kick frequency within 30 seconds was completed.

6. Interim test data of pre-test and after the 8th week were collected.

7. The data were processed and analyzed, systematically classified, and the accuracy of the data was checked.

Data Analysis

1. Descriptive statistical analysis: Mean ($\bar{x}$), Standard Deviation (S.D.), and Frequency to summarize the basic characteristics and data distribution of the sample.

2. Content analysis: Analysis of the answers of 5 expert interviews and 9 experts' consulting results from the focus group method.

3. The comparison analysis between groups was an independent sample t-test, and the comparison analysis within groups was a paired sample t-test. The criteria were a .05 level of significance.

Results

Develop a specific training program to improve the physical fitness and side kick skill for female Wushu Sanda athletes.

The important components of the special training program are as follows: the first week focus on familiar with basic physical fitness and skill movement; the second week focus on Enhance lower limb strength and explosive power; the third week focus on Improve core strength and accuracy; the fourth week focus on comprehensive improvement and actual combat simulation; the fifth week suggest to rest and recovery; the sixth week focus on strengthening of lower limb strength and explosive force; the seventh week focus on strength and speed training and the final week focus on the review of all training sessions and rest and recovery.

Experiment with the specific training program to improve the physical fitness and side kick skill for female Wushu Sanda athletes.

A focus group consisting of which consists of Wushu Sanda coaches, Wushu Sanda referees, Wushu teachers, fitness trainers, and Wushu Sanda team managers was set up to discuss and study all aspects of the training program to ensure the comprehensiveness and pertinence of the training program. Then, an 8-week training program was designed based on the specific situation of the students, and the IOC (content validity index) test results showed that the IOC value was 0.94, indicating that the expert group recognized the feasibility of the training program. And the reliability test with a small group was 0.85. Finally, the experiment was carried out based on the content of the specific training program. (Full version can be seen in Appendix 2)

Table 2 Specific training program to improve the physical fitness and side kick skill for female Wushu Sanda athletes' outline.

	Pre-test
	Week 1
Monday	Core strength training + Side kick basic form practice.
Wednesday	Lower strength training + Side kick coherent motion practice.

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	Pre-test
Friday	Core strength and lower strength training + Side kick power practice
	Week 2
Monday	Speed and Agility + Side kick speed practice
Wednesday	Agility and Accuracy + Side kick coherent motion practice.
Friday	Speed, Agility, and Accuracy + Side kick coherence and quickness practice.
	Week 3
Monday	Core strength training + Side kick power and quickness practice
Wednesday	Lower strength training + Combine side kick power with speed
Friday	Core strength and lower strength training + Side kick on the target mark and speed practice
	Week 4
Monday	Speed and Agility + Combine side kick speed with strength.
Wednesday	Agility and Accuracy + Side kick power and target mark practice
Friday	Speed, Agility, and Accuracy + Side kick actual combat simulation practice.
	Week 5
Monday	Review and adjust the side kick movements.
Wednesday	Rest and recovery
Friday	Review and adjust the side kick movements.
	Week 6
Monday	Core strength training + Combine side kick speed with accuracy
Wednesday	Lower strength training + Side kick power and speed practice
Friday	Core strength and lower strength training + Combine side kick speed with strength
	Week 7
Monday	Speed and Agility + Side kick speed and strength combination practice
Wednesday	Agility and Accuracy + Combine side kick speed with target mark practice.
Friday	Speed, Agility, and Accuracy + Side kick target mark and accuracy practice
	Week 8
Monday	Review and adjust the side kick movements.
Wednesday	Rest and recovery
Friday	Review and adjust the side kick movements.
	Post Test

The experimental results

In this step, the researcher would summarize the experimental results analysis. The independent sample t-test was used for comparison of data between groups. Comparison analysis within groups used a paired sample t-test. ($p<0.05$, which means it has significant difference; $p>0.05$ means no significant difference). After data analysis, the research results could be summarized in the table below.

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Table 3 Characteristics of the sample for the experimental group and the control group. (n=44)

No	Variables	Exp. Group (n=22)		Cont. group (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Age (year)	16.59	0.79	16.73	0.70	-0.602	0.55
2	Height (cm)	164.41	4.80	167.77	5.08	-0.244	0.80
3	Weight (kg)	54.55	6.48	55.27	6.50	-0.371	0.71

p > 0.05 represents that there is no significant difference.

Table 3 found that the age, height, and weight of sample on the experimental group were: age (years), =16.59±0.79 height (cm.), = 164.41±4.80 weight (kg.), = 54.55±6.48 respectively; the means and standard of the age, height, and weight of sample on the control group were: age (years), = 16.73±0.70 height (cm.), = 167.77±5.08 weight (kg.), = 55.27±6.50 respectively. The comparison of the characteristics of the sample between the experimental group and the control group showed no significant differences on all variables (p>0.05).

Table 4 The comparison of physical fitness on pre-test and post-test within the experimental group (n=44)

No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Standing long jump (Cm.)	197.14	9.64	206.72	10.75	-10.698	0.01*
2	Wall sit (Second)	87.90	21.23	107.40	20.20	-13.311	0.01*
3	50-meter sprint (Seconds)	8.08	0.25	7.84	0.022	10.875	0.01*
4	T-test (Second)	16.79	1.88	16.01	1.24	4.909	0.01*

p < 0.05 represents are significant difference

Table 4 found that comparison results of physical fitness on pre-test and post-test within the experimental group showed significant differences on all variables (p<0.05).

Table 5 The comparison of physical fitness on pre-test and post-test within the control group (n=44)

No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Standing long jump (Cm.)	195.31	12.09	197.50	12.19	-10.168	0.01*
2	Wall sit (Second)	76.77	33.83	83.27	34.27	-2.582	0.17
3	50-meter sprint (Seconds)	8.25	0.20	8.21	0.21	5.385	0.01*
4	T-test (Second)	15.74	1.22	15.61	1.23	4.248	0.01*

p < 0.05 represents are significant difference

Table 5 found that the comparison of physical fitness on pre-test and post-test within the control group showed no significant difference in Wall sit variables (p>0.05).

Table 6 The comparison of physical fitness on post-test between the experimental group and the control group (n=44)

No	Variables	Exp. Group (n=22)		Cont. group (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Standing long jump (Cm.)	206.72	10.75	197.50	12.19	2.661	0.01*
2	Wall sit (Second)	107.40	20.20	83.27	34.27	2.846	0.01*
3	50-meter sprint (Seconds)	7.48	0.22	8.21	0.21	-5.546	0.01*

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No	Variables	Exp. Group (n=22)		Cont. group (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
4	T-test (Second)	16.01	1.24	15.61	1.23	1.080	0.28

$p < 0.05$ represents are significant difference

Table 6 found that the comparison of physical fitness on post-test between the experimental group and control group showed no significant difference on T-test variables ($p>0.05$).

Table 7 The comparison of side kick skills on pre-test and post-test within the experimental group (n=44)

No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	High kick (Frequency)	41.86	1.55	45.95	2.19	-12.215	0.01*
2	Low kick (Frequency)	51.31	1.39	55.40	2.19	-12.716	0.01*

$p < 0.05$ represents are significant difference

Table 7 found that the comparison of side kick skills on pre-test and post-test within the experimental group showed significant differences on all variables ($p<0.05$).

Table 8 The comparison of side kick skills on pre-test and post-test within the control group (n=44)

No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	High kick (Frequency)	39.63	2.34	41.04	2.47	-11.196	0.01*
2	Low kick (Frequency)	50.54	2.34	52.13	2.23	-9.370	0.01*

$p < 0.05$ represents are significant difference

Table 8 found that the comparison of side kick skills on pre-test and post-test within the control group showed significant differences on all variables ($p<0.05$).

Table 9 The comparison of side kick skills on post-test between experimental group and control group (n=44)

No	Variables	Exp. Group (n=22)		Cont. group (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	High kick (Frequency)	45.95	2.19	41.04	2.47	6.959	0.01*
2	Low kick (Frequency)	55.40	2.19	52.13	2.23	4.902	0.01*

$p < 0.05$ represents are significant difference

Table 9 found that the comparison of side kick skills on post-test between the experimental group and the control group showed significant differences on all variables ($p<0.05$).

Table 10 The comparison of the FMS test on pre-test and post-test within the experimental group (n=44)

No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Deep Squat	2.54	0.50	2.90	0.29	-3.464	0.02*
2	Hurdle Step	2.40	0.50	3.00	0.00	-5.508	0.00*
3	Inline Lunge	2.45	0.50	3.00	0.00	-5.020	0.00*
4	Shoulder Mobility	2.50	0.51	3.00	0.00	-4.583	0.00*
5	Active Straight-Leg Raise	2.31	0.47	2.86	0.35	-5.020	0.00*

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No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
6	Trunk Stability Push-up	2.36	0.49	2.90	0.29	-5.020	0.00*
7	Rotary Stability	2.31	0.47	3.00	0.00	-6.708	0.00*

p > 0.05 represents that there is no significant difference

Table 10 found that a comparison of the FMS test on pre-test and post-test within the experimental group showed significant differences on all variables (p<0.05).

Table 11 The comparison of the FMS test on pre-test and post-test within the control group (n=44)

No	Variables	Pre-test (n=22)		Post-test (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Deep Squat	2.54	0.50	2.63	0.49	-1.449	0.16
2	Hurdle Step	2.36	0.49	2.63	0.49	-2.806	0.01*
3	Inline Lunge	2.45	0.50	2.63	0.49	-2.160	0.42
4	Shoulder Mobility	2.63	0.49	2.72	0.45	-1.449	0.16
5	Active Straight-Leg Raise	2.36	0.49	2.45	0.50	-1.449	0.16
6	Trunk Stability Push-up	2.36	0.49	2.50	0.51	-1.821	0.83
7	Rotary Stability	2.31	0.47	2.50	0.51	-2.160	0.42

p < 0.05 represents are significant difference

Table 11 found that a comparison of the FMS test on pre-test and post-test within the control group there was significant difference in hurdle step variables (p<0.05).

Table 12 The comparison of the FMS test on post-test between the experimental group and the control group (n=44)

No	Variables	Exp. Group (n=22)		Cont. group (n=22)		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Deep Squat	2.90	0.29	2.63	0.49	2.230	0.03*
2	Hurdle Step	3.00	0.00	2.63	0.49	3.464	0.01*
3	Inline Lunge	3.00	0.00	2.63	0.49	3.464	0.01*
4	Shoulder Mobility	3.00	0.00	2.72	0.45	2.806	0.01*
5	Active Straight-Leg Raise	2.86	0.35	2.45	0.50	3.100	0.01*
6	Trunk Stability Push-up	2.90	0.29	2.50	0.51	3.250	0.01*
7	Rotary Stability	3.00	0.00	2.50	0.51	4.583	0.01*

p < 0.05 represents are significant difference

Table 12 found that a comparison of the FMS test on post-test between the experimental group and the control group showed significant differences on all variables (p<0.05).

Summary: After 8 weeks of using the specific training program to improve the physical fitness and side kick skill for female Wushu Sanda athletes, the physical fitness within the experimental group was significantly improved. (p value < 0.05), But in the control group, the post-test result of the wall sit variable showed no significant difference when compared with the pre-test result. In the comparison of physical fitness on post-test between the experimental group and control group, there was no significant difference in T-test variables (p>0.05).

Comparison of side kick skills found that the results on pre-test and post-test within the experimental group, within the control group, and comparing the post-test results between groups, there were significant differences on all variables (p<0.05). Comparison of FMS test on pre-test and post-test within the experimental group, there was a significant difference on all variables (p<0.05), but in the FMS test on pre-test and post-test within the control group, there was a significant difference only

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in hurdle step variables ($p<0.05$). And a comparison of the FMS test on post-test between the experimental group and control group, there were significant differences on all variables ($p<0.05$).

Discussion

On the comparison results of physical fitness on pre-test and post-test within the control group, there was no significant difference in muscle endurance (Wall sit) variables, and the comparison of physical fitness on post-test between the experimental group and control group, there was no significant difference in agility (T-test) variables. This means that after 8 weeks of the experiment, the muscle strength and agility in the control group were slightly improved, but there was no statistically significant difference. This may be because in traditional Wushu Sanda training, leg muscle strength and agility are already emphasized, and the leg muscle training and agility intensity will not change because leg muscles and agility can be developed from training different kicking postures which is consistent with the results of Yang et al (2008) discussed Zhang Fengyi's focused on the implemented 13 weeks of core strength training. It can be seen from the test results of the experimental subjects that after the experiment improved greatly compared with before the experiment, the balance ability and explosive power of the experimental subjects improved greatly, but the control group result found that the core strength and agility did not significant difference.

On the comparison of side kick skills on pre-test and post-test within the experimental group, within the control group, and the comparison of side kick skills on post-test between the experimental group and control group, there were significant differences on all variables. This means that after 8 weeks of the experiment, the kicking speed and frequency of both groups of athletes were significantly improved because of physical fitness training such as muscle training, muscle endurance and speed, making the athletes more physically capable which is consistent with the results of Yao (2008) selected 20 students from two Sanda classes of Tianjin Institute of Physical Education as the experimental subjects. The results found that good physical quality is the premise of leg use, because the leg is an important scoring method, the outcome is the key to the quality of the leg's strength and speed, which comes from good physical fitness.

On the comparison of the FMS test on pre-test and post-test within the control group, there was a significant difference only hurdle step variables. This means that the 8-week experiment in the control group using traditional training methods could only improve hurdle step ability. This may be because traditional training emphasizes whole-body agility training with an emphasis on the legs, so the athletes' leg ability will be developed faster and better, which is consistent with the results of Chtara et al (2008) mention that the movement patterns and sequences seamlessly are essential for Wushu Sanda performance. Agility of changes in direction, footwork patterns, and body positioning demands excellent agility and body control.

Recommendations

Application of the research

1. Apply the methods and process of this specific training program to wushu sanda training on another group of athletes

2. Before using this specific training program, the coaches should be trained to understand the concepts and technic to success the desired output of the training.

For further research

1. Use the research method and training content as a basis for developing abilities or skills in other aspects of Wushu.

2. Combine with the other method and technique to optimize the athlete’s performance, such as psychological training, biomechanical analysis.

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