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Development of Wushu Training Program to Improve Tornado Kick Skill of Students Aged 7-9 Years Old

Ma Lili[1], Saknasan Jintasakul[2], and Prakit Hongsaenyatham[3]
[1,2,3]Faculty of Sports Science and Technology, Bangkokthonburi University, Thailand
[1]E-mail: 1120365321@qq.com, ORCID ID: https://orcid.org/0009-0002-7646-1850
[2]E-mail: surat.jin@gmail.com, ORCID ID: https://orcid.org/0009-0009-9124-8872
[3]E-mail: prakitsport@gmail.com, ORCID ID: https://orcid.org/0009-0009-2196-0258
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Abstract
Background and Aim: The tornado kick, a complex and high-level skill in wushu, presents significant challenges for young learners due to its demands on balance, coordination, strength, and agility. The tornado kick is a complex movement that involves a combination of rotation, timing, and a high kick. Younger children have difficulty synchronizing these movements due to their still-developing motor coordination. Therefore, this research was to develop a wushu training program to improve the tornado kick skill of students aged 7-9 years old.
Materials and Methods: This research was quasi-experimental. The population of this research consists of 42 students, aged 7-9 years old, from the wushu club at Shanghai Putuo District Youth Sports School. All 42 students aged 7-9 years old from the wushu club will participate in the tornado kick skill test, with their scores being recorded. From this group, a sample of 30 students who score the lowest on the test and volunteer to participate in the research will be selected as a sample group. Through a systematic sampling method, 30 students were divided into 2 groups: 15 students in the experimental group and 15 students in the control group. The training was conducted over 8 weeks. The experimental group and the control group were administered the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test before the training, after 4 weeks of training, and upon completion of the 8-week training program. In this research, mean, standard deviation, one-way repeated measures ANOVA, Bonferroni post hoc, and independent t-tests were used to analyze the data.
Results: After training with the developed wushu training program, the tornado kick skill, 60-second sit-ups, and sit-and-reach in the experimental group had a significant difference, $p<.05$, between pretest-mid-test, pretest-posttest, and mid-test-posttest. This indicates that the tornado kick skill, strength, and flexibility of the students in the experimental group had significant improvements at all time points.
Conclusion: The comparison between the experiment and control groups, with the post-test results of the tornado kick skill test the test results showed a significant difference. This indicates that the developed Wushu training program more effectively improves the tornado kick skill of students aged 7-9 years old.
Keywords: Wushu; Wushu Training Program; Tornado Kick Skill; Students

Introduction

China has a rich cultural heritage, and wushu, as both a traditional practice and a sport with national characteristics, reflects thousands of years of inheritance. The legacy of wushu not only serves the purpose of physical strengthening but also embodies the integration of the national spirit. It represents the tenacity, bravery, and fighting spirit of the Chinese people, with martial virtues being a key aspect of China's cultural legacy. In 2014, the Ministry of Education issued the "Opinions on Comprehensively Deepening Curriculum Reform and Implementing the Fundamental Task of Moral Education," which emphasized promoting China's traditional virtues alongside modern values. This policy encourages the integration of China's outstanding traditional culture with contemporary education, aiming to enhance social morality and advance the preservation of Chinese heritage through education (Liu, 2020). Wushu, a traditional Chinese martial art, offers numerous physical, cognitive, and social benefits, particularly for young learners. Traditional Chinese wushu places a strong emphasis on martial ethics, with the principle that one must cultivate virtue before practicing wushu. Martial ethics serve to regulate and guide the behavior of martial artists, ensuring harmonious relationships both among practitioners and between martial artists and society at large. It also serves as a pathway for martial artists to strive for higher spiritual development. The core values of traditional Chinese wushu are as follows: "benevolence, righteousness, courtesy, faith, and courage", which are both the ultimate goals of wushu and the essence of martial ethics. By embracing these

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values, martial artists can foster harmonious relationships with others, reflecting the profound spiritual dimension of martial ethics (Yang and Duan, 2020).

Moreover, because wushu has a rich history and broad popular appeal, it's the primary aim of preserving and promoting China's cultural heritage. The Five-Year Plan for the Development of Chinese Wushu (2016-2020) emphasizes the need to vigorously promote wushu culture, strengthen the transmission of traditional wushu, and expand wushu education in schools. Learning wushu helps cultivate the spirit and resilience of primary school students, promoting both their physical and mental well-being while inspiring their ambition. Unlike other forms of education, martial arts education offers unique benefits. Rooted in physical education, it holistically enhances students' moral values, labor skills, and physical and mental health, thereby contributing to the development of their overall physical literacy (Su, 2019). Introducing wushu to primary school students can significantly contribute to their moral education by instilling these ethical principles, helping them learn respect, care for others, and build harmonious relationships within society. Incorporating wushu education into the primary school curriculum can foster a deeper sense of patriotism and national pride in students. Through this educational process, they will gain a greater appreciation for the richness and significance of traditional culture, which in turn boosts their self-confidence and enhances their character (Yang, 2020).

Wushu is a sport that requires specialized skills, featuring diverse routines that are both intense and engaging. As such, it plays a significant role in enhancing students' physical fitness and coordination. Additionally, through rigorous training and self-discipline, Wushu helps strengthen the willpower of primary school students, fostering a spirit of perseverance and hard work. By integrating the values of traditional Chinese culture, such as martial virtues and loyalty to the country, it can inspire students to develop a deeper passion for learning wushu. This, in turn, promotes continuous improvement in their physical health, increases their appreciation for traditional martial arts, and supports their overall development (Zhang and Chen, 2018). Wushu training for children aged 7-9 years old involves introducing young learners to the fundamentals of traditional Chinese wushu. At this age, children are in a critical period of physical and cognitive development, making it an ideal time to start training in a structured yet engaging environment. The training focuses on building foundational skills in coordination, balance, flexibility, and discipline while promoting mental and emotional growth (Liu and Cui, 2019).

The tornado kick, a complex and high-level skill in wushu, presents significant challenges for young learners due to its demands on balance, coordination, strength, and agility. Despite its importance in wushu training, there is limited research on how to effectively teach and improve the tornado kick skill among young students, particularly those aged 7-9 years old. Developing an age-appropriate training program tailored to this group is crucial for enhancing their performance in this skill while also promoting physical development (Wang and Yang, 2019). The problem, therefore, is to investigate the effects of a specifically designed wushu training program on the tornado kick performance of students aged 7-9 years old and to identify the key factors that contribute to their mastery of the skill. The tornado kick is a complex movement that involves a combination of rotation, timing, and a high kick. Younger children have difficulty synchronizing these movements due to their still-developing motor coordination. This lack of coordination can result in incomplete or unbalanced execution of the kick, making it harder for the student to perform the technique correctly. As mentioned above, the tornado kick involves complex mechanics, including spinning, jumping, and kicking in one fluid motion. Therefore, young children will struggle to comprehend and remember all the steps involved in performing the technique. Without a clear cognitive understanding of the steps, students may execute the kick incorrectly, leading to improper form and limited progress. Additionally, children aged 7-9 years old are still developing their muscular strength, coordination, and flexibility. The tornado kick requires significant core strength, leg power, and coordination, which might be difficult for younger students to achieve (Miller, 2016). Moreover, the spinning motion and the high impact of the kick can make children fearful of falling or hurting themselves. A lack of confidence in their physical abilities may cause them to hesitate, reducing the effectiveness of the training. This research

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focuses on the 360-degree tornado kick, which is considered a fundamental and essential technique in wushu taolu and can be performed by students aged 7-9 years old.

In summary, understanding the effects of a wushu training program on young students' tornado kick skills is critical for improving instructional methods. By identifying the most effective training strategies, teachers and coaches can help children develop the balance, coordination, and muscular strength necessary for this complex move. Therefore, this research aims to develop a wushu training program to improve the tornado kick skill of students aged 7-9 years old, and to study the effects of the wushu training program by comparing the effects of a developed wushu training program with a traditional training program to analyze which program better enhances the tornado kick skill for students aged 7-9 years old.

Research Objectives

Main Objective

To develop a wushu training program to improve the tornado kick skill of students aged 7-9 years old.

Subsidiary Objectives

1. To study the problems of tornado kick skill training of students aged 7-9 years old.
2. To draft a wushu training program to improve the tornado kick skill of students aged 7-9 years old.
3. To compare the developed wushu training program with the traditional training program, to analyze which program better improves the tornado kick skill of students aged 7-9 years old.

Literature Review

1. Wushu in primary school

Wushu is a traditional national sport and a fitness method in China. Chinese wushu boasts a history spanning thousands of years, serving as a cultural treasure of the Chinese nation. In the physical education curriculum of primary and secondary schools, wushu is included as a key component of physical education instruction. Learning wushu enhances students' physical fitness and supports the comprehensive implementation of educational policies (Zhou and Chen, 2019).

Children and adolescents, being in a crucial stage of development, require appropriate exercise that engages their muscles, bones, nerves, and internal organs. Many wushu practices incorporate both internal and external training, often described as "external training of muscles, bones, and skin, and internal training of spirit, energy, and will." Wushu training helps develop essential physical qualities in students, such as flexibility, agility, speed, coordination, and accuracy. It also enhances the stretchability and elasticity of muscles and ligaments, increases the range of motion and flexibility of joints, and improves the functions of the central nervous system, as well as cardiovascular and respiratory systems. Additionally, wushu training, coupled with wushu education, fosters students' ideological and moral development, promotes the spirit of wushu, and enhances national pride. The movements in wushu are graceful and aesthetically pleasing, combining beauty with discipline. Scientific research indicates that wushu not only promotes physical beauty but also cultivates kindness and improves IQ. The long-term practice of wushu is highly beneficial for students and can yield lifelong advantages (Chen, 2018).

Currently, many schools, particularly those in rural areas, lack adequate sports equipment and resources, resulting in dull and uninspiring physical education classes and extracurricular activities. By strengthening wushu instruction and extracurricular wushu activities in these schools, this situation can gradually be transformed. Children are naturally lively and active, showing a strong interest in learning wushu. Moreover, wushu instruction requires minimal equipment, needing only a suitable venue. In terms of instructors, wushu teaching can be conducted by physical education teachers with wushu experience, or by hiring martial arts enthusiasts from outside the school as teachers or counselors. If rural primary and secondary schools implement wushu enlightenment education and begin training children in wushu, it will have far-reaching implications for popularizing wushu activities and enhancing the level of wushu practice

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in China (Wang & Yang, 2020). In today's world, characterized by rapid technological advancements and the prevalence of computer networks, the practice of physical martial arts education in primary schools must adapt to contemporary demands. Teachers need to align their methods with the current developmental context. Utilizing multimedia teaching as a primary instructional tool can enhance the effectiveness of martial arts training. However, this shift presents a significant challenge for wushu instructors, primarily because the effectiveness of multimedia teaching often hinges on the quality of courseware created. Courseware that is poorly designed or does not accurately represent martial arts movements may fail to achieve the desired educational outcomes. To ensure clear and intuitive teaching, instructors can highlight key movements and use visual aids, such as arrows, to illustrate the direction of specific techniques. This approach helps students gain a deeper understanding of the movements, laying a solid foundation for future learning (Yan, 2019).

2. Tornado kick skill

The Tornado Kick, also known as the "Jumping Spin Kick" or "360 Roundhouse Kick," is a dynamic and visually impressive technique commonly practiced in martial arts such as Wushu, Taekwondo, and Karate. It involves a spinning motion combined with a high, airborne kick, making it a complex movement that requires agility, balance, coordination, and timing. Its concept revolves around generating maximum rotational force combined with a kick to deliver a powerful and swift strike, typically aimed at an opponent's upper body or head (Zhang, 2015).

In Wushu, the tornado kick is a fundamental technique often incorporated into Taolu (forms) routines due to its aesthetic appeal and difficulty. It combines speed, power, and grace, contributing significantly to scoring in competitions. The move showcases not only martial prowess but also athleticism and artistic expression (Wu, 2019). The tornado kick requires strong core muscles and excellent balance to maintain control during the airborne spin. The explosive power to jump high and spin quickly is essential, particularly in the legs. Moreover, perfect timing between the spin, jump, and kick is crucial for proper execution. The athlete needs to have a good range of motion, particularly in the hips and legs, to perform the high kick effectively (Zang and Li, 2017).

Tornado kick skill is both visually impressive and functionally effective in martial arts, requiring flexibility, speed, coordination, and practice to master. The key elements of the Tornado Kick include: (1) Rotation and Momentum, the kick starts with a spin, where the body rotates 360 degrees, creating centrifugal force that adds power to the kick; (2) Footwork, proper foot positioning and pivoting are essential to maintain balance while generating the spin's momentum; (3) Lift-off and Leg Extension, as the practitioner spins, they leap off the ground, and at the peak of the jump, the kicking leg extends towards the target; (4) Timing and Precision, the success of the Tornado Kick depends on precise timing—delivering the kick at the optimal point in the rotation, maximizing impact; (5) Control and Balance, after the kick, landing smoothly while maintaining balance is critical to avoid being vulnerable to counterattacks (Kim, and Lee, 2018).

3. 360° tornado kick skill of students aged 7-9 years old

360° tornado kick skill is a foundational technique in wushu taolu, characterized by its dynamic and graceful movement. For students aged 7-9 years old, it serves as an essential skill that develops their strength, coordination, and flexibility. The skill involves a sequence of movements, starting with a controlled run-up, followed by an explosive takeoff, a mid-air rotation, and a snapping kick at the peak of the jump. Finally, the movement ends with a stable and balanced landing, demonstrating the student's control and precision. Each phase requires focused attention to technique and progression to ensure proper execution. Developing the tornado kick in young learners requires careful consideration of their physical capabilities. Strength in the legs and core is critical for generating the jump's power and maintaining rotational stability. Flexibility, particularly in the hips, hamstrings, and lower back, allows students to perform the kicking motion fluidly. Coordination is also vital as the movement demands precise timing

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between the jump, rotation, and kick. By breaking down the technique into manageable drills and exercises, young students can gradually build confidence and mastery over time (Ma and Wu, 2018).

Training programs for students aged 7-9 years old must emphasize safety and progression. Introducing simplified variations of the kick, such as a 180-degree turn, helps build foundational skills before advancing to the full rotation. Drills focusing on jumping power, balance, and flexibility can support their physical development, while the use of padded mats and close supervision minimizes the risk of injuries. Encouraging creativity and expression within the boundaries of proper technique also fosters their enthusiasm for Wushu and allows them to enjoy the learning process. Mastering the 360-degree tornado kick provides numerous benefits for students aged 7-9 years old. Physically, it enhances their strength, agility, and overall motor skills. It also builds self-confidence, as the ability to perform such a visually impressive skill gives them a sense of accomplishment. Furthermore, learning this foundational movement prepares them for more advanced wushu techniques, laying the groundwork for future success in the discipline. Through consistent practice and guided instruction, young students can develop not only the technical aspects of the kick but also their passion for wushu (Zhang and Liu, 2019).

Moreover, the ability of students aged 7-9 years old to train in the 360° tornado kick skill depends on their physical development, coordination, and cognitive understanding of the technique. At this age, children are generally in the early stages of developing their motor skills, which include balance, agility, and spatial awareness. These attributes are critical for performing the tornado kick as it involves a dynamic combination of jumping, rotating, and kicking. While young learners may lack the explosive power of older athletes, they are typically more flexible, which can be an advantage in mastering the necessary leg and body positions. Physical strength also plays a significant role in a child's ability to train this skill. Students aged 7-9 years old may have limited muscular development compared to older athletes, making it essential to focus on building foundational strength gradually. Simple exercises such as bodyweight squats, single-leg hops, and core stability drills can enhance their jumping power and rotational control. These preparatory activities not only improve physical fitness but also help prevent fatigue and injuries during training. Regular practice with incremental difficulty ensures that young learners build the necessary strength safely over time. Coordination and timing are equally important for mastering the tornado kick. This skill requires precise synchronization of the jump, rotation, and kick, which can be challenging for children at this developmental stage. Training programs should incorporate coordination drills, such as skipping, balance exercises, and basic jumping techniques, to improve the students' ability to execute the movement smoothly. Breaking the technique into smaller components and practicing each phase individually helps young learners understand and refine their movements before combining them into the complete kick (Li and Zhang, 2018).

4. Physical fitness is essential for developing tornado kick skill in wushu

The tornado kick is a dynamic and foundational movement in wushu, requiring a harmonious blend of strength, flexibility, coordination, and balance. To execute this technique effectively, athletes must develop a comprehensive physical fitness regimen that addresses both the explosive nature of the kick and its intricate mechanics. The key components of physical fitness essential for mastering the tornado kick skill are as follows:

1. Muscle strength

Muscle strength plays a pivotal role in the effective execution of the tornado kick, a foundational technique in wushu. This skill requires a combination of explosive power, control, and precision, all of which are directly influenced by the strength of various muscle groups. Without adequate muscular development, achieving the necessary height, speed, and accuracy for this movement becomes challenging. The tornado kick begins with an explosive takeoff that requires significant lower-body strength. The quadriceps, glutes, and calves are the primary muscles responsible for generating the force needed to lift the body off the ground. Strong legs enable athletes to achieve the required height for rotation and create

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momentum for the spinning motion. Without sufficient strength, the jump may lack the power needed, compromising the effectiveness of the technique (Cheng, 2021).

Core strength is vital for maintaining stability during the spinning phase of the Tornado Kick. The abdominal and oblique muscles, along with the lower back, work together to control the body's rotation and keep the athlete balanced. A strong core ensures that the spin is smooth and aligned, allowing for a more controlled and accurate kick. Weak core muscles can result in unstable movements, reducing the precision and impact of the technique. Muscle strength in the hips, thighs, and hamstrings directly affects the height and power of the kick itself. Strong hip flexors allow for a higher and faster leg lift, while the hamstrings and glutes contribute to the follow-through of the kick. This combination ensures that the kick is not only visually impressive but also impactful. Building strength in these areas also helps athletes maintain proper form, minimizing the risk of injury during high-intensity training sessions. The Tornado Kick requires precise balance during the takeoff, spin, and landing phases. Strong stabilizing muscles, particularly in the legs and core, play a crucial role in maintaining control throughout these transitions. A solid foundation of strength helps athletes absorb the impact of landing while staying upright and ready for subsequent movements. This is especially important for young learners, who need additional support to develop their coordination and balance. Repetitive practice of the Tornado Kick can strain the body, particularly in younger athletes. Building muscle strength not only improves performance but also helps prevent fatigue during extended training sessions. Strong muscles provide better support to joints, reducing the risk of injuries such as sprains or strains. Additionally, strength training fosters muscular endurance, enabling athletes to perform the kick repeatedly without losing form or precision (Tian, 2019).

In summary, muscle strength is a cornerstone of developing the tornado kick skill. It enables explosive movement, supports balance and control, enhances kick power, and reduces the risk of injury. By prioritizing strength training as part of their physical fitness regimen, athletes can improve their overall performance and master this complex wushu technique with confidence.

2. Flexibility

Flexibility is a fundamental attribute in mastering the tornado kick, one of the most iconic techniques in wushu. This skill requires a combination of high leg lifts, precise body alignment, and fluid motion, all of which rely on optimal flexibility. Without sufficient flexibility, athletes may struggle to perform the tornado kick effectively or risk injury during training.

Flexibility, particularly in the hip flexors, hamstrings, and adductors, is essential for achieving the high leg lift required for the tornado kick. A well-executed kick demands a wide range of motion to create an aesthetically pleasing and technically sound movement. Flexible muscles and joints allow for smooth, unrestricted motion, enabling athletes to elevate their kicking leg higher with less effort and greater precision. Without adequate flexibility, the kick may appear stiff or lack the necessary height for effective execution. Wushu emphasizes grace and elegance in its movements, and flexibility is a key factor in achieving this fluidity. The tornado kick involves a continuous transition from jumping to spinning and kicking. Flexible muscles help reduce resistance during these transitions, allowing the movement to flow seamlessly. This fluidity not only enhances the aesthetic appeal of the technique but also ensures that the kick meets the performance standards required in competitions (Wang, 2021).

Moreover, inadequate flexibility can lead to muscle strains, joint discomfort, or other injuries, especially in young athletes learning the Tornado Kick. Tight muscles restrict motion and force the body to compensate, often leading to improper technique or overstressed joints. Stretching exercises that improve flexibility in key areas such as the hips, groin, and lower back help prepare the body for the demands of the tornado kick. This preparation minimizes the risk of injury, particularly during the explosive phases of the jump and kick. Flexibility contributes to better body alignment, which is critical for executing the tornado kick with precision. Flexible hip and core muscles help athletes maintain a straight posture during the spin, ensuring balance and stability. Furthermore, the ability to extend the kicking leg fully without overcompensating in other areas promotes proper technique. Enhanced alignment and control lead to more consistent and effective performance of the skill. For young athletes aged 7-9 years old, flexibility is

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particularly important as their bodies are still developing. Regular flexibility training not only aids in mastering the tornado kick but also contributes to long-term athletic performance. A flexible foundation allows athletes to adapt to more complex movements and reduces wear and tear on their bodies over time. Dynamic and static stretching routines incorporated into training help these young learners build a lifelong habit of maintaining flexibility, which benefits their overall physical fitness and sport performance (Chan and Hong, 2000).

In conclusion, flexibility is a critical component of the physical fitness required for developing the tornado kick skill in wushu. It enhances range of motion, improves fluidity and aesthetics, reduces injury risks, and supports proper body alignment. By prioritizing flexibility training, athletes can achieve technical proficiency while safeguarding their physical well-being and long-term performance potential.

Summary

Wushu is a traditional Chinese martial art that emphasizes fluid movements, agility, and physical coordination. The Tornado Kick, a key technique in Wushu, combines elements of acrobatics and martial arts, requiring flexibility, balance, and strength. This skill is particularly beneficial for children as it enhances their overall physical fitness and motor skills. Studies show that Wushu training enhances physical fitness parameters in young athletes. It improves cardiovascular endurance, muscular strength, and flexibility, which are crucial for executing the tornado kick. Additionally, engaging in Wushu has been linked to increased motivation and enjoyment in physical activity among children. Research on skill acquisition highlights the importance of structured training programs in mastering complex movements. Wushu training incorporates progressive drills that emphasize the run-up, take-off, aerial rotation, and landing phases of the tornado kick. Such structured practices help children internalize the mechanics of the kick, leading to improved performance. Beyond physical advantages, participating in Wushu training fosters psychological resilience and social interaction. Children learn discipline, focus, and teamwork through martial arts, which can enhance their confidence and willingness to participate in physical activities. Empirical studies examining the effects of Wushu training on the tornado kick skill indicate significant improvements in performance metrics. Children who participated in structured Wushu programs demonstrated higher success rates in executing the Tornado Kick compared to those who did not undergo such training. The findings suggest that consistent practice in Wushu not only develops the tornado kick skill but also contributes to overall motor skill development.

Conceptual Framework

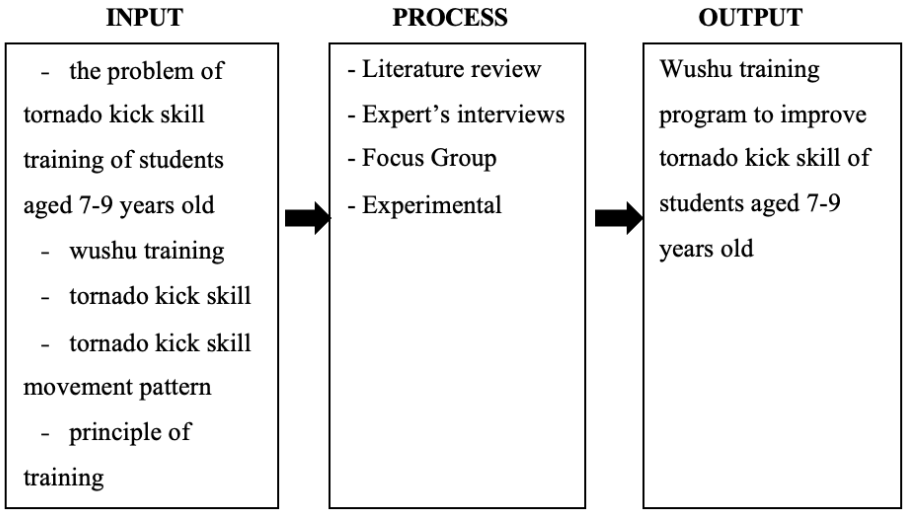

Figure 1 Conceptual framework

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Methodology

1. Research Tools

In this research, the following tools were used to conduct the research: (1) an interview form; (2) a Focus group outline; (3) a Wushu training program; (4) a Tornado kick skill test; (5) a 60-second sit-up test; (6) a sit-and-reach test.

2. Population and Sample

The population of this research consists of 42 students, aged 7-9 years old, from the wushu club at Shanghai Putuo District Youth Sports School, who possess basic wushu skills but require further training to enhance and develop more advanced techniques.

All 42 students aged 7-9 years old from the wushu club of Shanghai Putuo District Youth Sports School will participate in the tornado kick skill test, during which their scores will be recorded. 30 students who achieve the lowest scores on the test and volunteer to participate will then be selected as a sample for the research. Through a systematic sampling method, 30 students will be divided into two groups, namely a control group of 15 students and an experimental group of 15 students.

3. Data Collection

1. A literature review will be conducted to study the wushu training method and to identify challenges related to the tornado kick skill training in students aged 7-9 years old. After studying the training methods and problems related to the tornado kick skill in students aged 7-9 years old through a review of relevant literature, the researcher developed an interview form to interview experts in order to investigate the current situation and problems in training the tornado kick skill.

2. 7 experts were invited to participate in face-to-face interviews. The goal of the experts' interview was to gather insights into the current situation and problems of tornado kick skill training for students aged 7-9 years old and analyze the components needed to design a wushu training program that enhances students' tornado kick skills.

3. Draft the framework of the wushu training program to improve tornado kick skill for students aged 7-9 years old.

4. Conduct a focus group discussion with 10 experts. The focus group discussion aimed to develop a wushu training program focused on improving tornado kick skill for students aged 7-9 years old.

5. Try out the developed wushu training program with 5 students to evaluate its suitability and intensity for use with the sample group, and to identify any shortcomings of the program for improvement.

6. Implement the training program over 8 weeks, with sessions scheduled 5 days per week (Monday through Friday), each lasting 2 hours per day. The experimental group will use the developed wushu training program. The training schedule will be divided into Monday 9.00-11.00, Tuesday 14:00-16:00, Wednesday 9.00-11.00, Thursday 14:00-16:00, and Friday 9.00-11.00. The control group will follow the traditional training program. The training schedule will be divided into Monday 14:00-16:00, Tuesday 9.00-11.00, Wednesday 14:00-16:00, Thursday 9.00-11.00, and Friday 14:00-16:00.

7. The experimental group and the control group will conduct the tornado kick skill test, the muscular strength test, and the flexibility test before the training, after 4 weeks of training, and upon completion of the 8-week training program. Subsequently, analyze and compare the test results between the experimental group and the control group to evaluate the effects of the wushu training program on improving the tornado kick skill for students aged 7-9 years old.

4. Data Analysis

This research primarily utilized a software package for data analysis, employing the following methods:

1. The content validity of questions in the expert interview form was evaluated using the Indexes of Items of Objective Congruence (IOC); the IOC value of the interviewing form = 0.93.

2. The experts' interview and focus group discussion were analyzed using content analysis.

3. The independent t-test was used to compare the test results between the experimental group and the control group.

4. The results of pre-test, after 4 weeks of training, and post-test (after 8 weeks of training) in the experimental group were analyzed using one-way repeated measures ANOVA and post hoc.

Results

The results of the research, based on this methodology, are presented in four key parts as follows:

Part 1: Investigate the current situation and problems of wushu training in the tornado kick skill of

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students aged 7-9 years old using experts' interviews.

Part 2: Develop a wushu training program to improve the tornado kick skill of students aged 7-9 years old by using focus group discussion.

Part 3: Confirm the effectiveness of the developed wushu training program by using an experimental method.

Part 1: Investigate the current situation and problems of wushu training in the tornado kick skill of students aged 7-9 years old using experts' interviews

This research employed a literature review and experts' interviews to collect data on the current situation and problems of wushu training in the tornado kick skill of students aged 7-9 years old. Seven experts, consisting of four wushu coaches and three physical education teachers specializing in wushu, will be invited to participate in face-to-face interviews to study the current situation and challenges in wushu training for the tornado kick skill among students aged 7-9 years old. In this process, the expert's interview results were analyzed by using content analysis.

Based on the interviews with these seven experts, the current situation and identified issues can be summarized as follows:

Part 1: Current situation of wushu training for tornado kick skill. Experts concluded that while the current training methods provide a solid foundation, improvements are necessary to enhance learning efficiency. Recommendations include implementing more individualized coaching to address specific weaknesses, utilizing structured assessment tools for better progress tracking, increasing training frequency and developing more effective training programs, and introducing confidence-building activities to help students overcome hesitation in executing the full movement.

Part 2: Problems in training the tornado kick skill. Experts agree that the tornado kick is highly complex for students aged 7-9 years old, due to challenges in coordination, balance, and strength. Key physical fitness components requiring attention include balance, leg strength, flexibility, and core stability, as many young students struggle with weak lower-body strength, limited flexibility, and fear of falling. Common difficulties include poor coordination and endurance issues, making skill execution inconsistent. To keep students engaged, instructors use game-based drills, progressive skill levels, visualization techniques, and positive reinforcement. Addressing these challenges through structured training and motivation strategies can enhance learning efficiency and skill acquisition.

Part 3: Essential components for designing a wushu training program for improving the tornado kick skill. Experts emphasize that an effective wushu training program for improving the tornado kick in students aged 7-9 should focus on a step-by-step skill progression, integrating strength, flexibility, balance, and coordination. Key components include core strength, lower-body power, flexibility exercises, and rotational drills. Drills like squats, plyometrics, and core stability exercises are essential for developing the necessary physical attributes. Training should last 8-12 weeks, with sessions held 3-4 times per week, focusing initially on technique and gradually increasing intensity. The program should be tailored to young learners' developmental stages, with shorter, focused sessions and positive reinforcement to maintain engagement and motivation.

Part 2: Develop a wushu training program to improve the tornado kick skill of students aged 7-9 years old by using a focus group discussion

A focus group of 10 experts was conducted to develop a wushu training program to improve the tornado kick skill of students aged 7-9 years old. The discussion content was analyzed using content analysis to identify key insights. Experts concluded that an effective wushu training program for 7- to 9-year-olds should emphasize progressive learning**,** physical conditioning**,** and engaging teaching strategies. The program should be structured over 8-12 weeks, with balanced training sessions focusing on strength, flexibility, coordination, and proper technique.

Following the focus group discussions, a wushu training program to improve the tornado kick skill of students aged 7-9 years was developed. This program will span 8 weeks, with training sessions held 5 days per week, each lasting 2 hours. Progressive skill development will break down the tornado kick into manageable phases (stance, rotation, landing). Physical conditioning will focus on strength, flexibility, balance, and coordination. The structure of the training program is outlined below:

Citation
Ma, L., Jintasakul, S., & Hongsaenyatham, P. (2025). Development of Wushu Training Program to Improve Tornado Kick Skill of Students Aged 7-9 Years Old. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 627-642; DOI: https://doi.org/10.60027/ijsasr.2025.7139

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Table 1 The framework of the wushu training program to improve the tornado kick skill of students aged 7-9 years

Time	Contents
Week 1	**Foundation Building** **Focus**: Basic strength, balance, and flexibility Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training: - **Monday**: Basic stance training, squats, lunges, and standing jump. - **Tuesday**: Balance exercises (e.g., single-leg stands), core stability drills (planks, leg raises). - **Wednesday**: Flexibility training (dynamic stretching for legs and hips). - **Thursday**: Controlled jump techniques, low-intensity plyometrics (e.g., box jumps) - **Friday**: Circuit training (squats, lunges, standing jumps, core exercises) 3. Cool-down: Jogging, static stretching (10 minutes)
Week 2	**Introduction to Rotation** **Focus**: Controlled rotation, leg strength, and coordination Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training: - **Monday**: Partial rotation drills (e.g., 90-degree jumps), squats, and lunges. - **Tuesday**: Core stability exercises (planks, rotational exercises), balance drills. - **Wednesday**: Flexibility training (dynamic and static stretching). - **Thursday**: Assisted rotation drills (e.g., using a partner or wall for support). - **Friday**: Circuit training (squats, lunges, standing jumps, core exercises). 3. Cool-down: Jogging, static stretching (10 minutes)
Week 3	**Full Rotation Execution** **Focus**: Full rotation, explosive power, and flexibility Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training: - Monday: Full rotation drills (e.g., 360-degree jumps), squats, and lunges. - Tuesday: Core stability exercises (planks, rotational exercises), balance drills. - **Wednesday**: Flexibility training (dynamic and static stretching). - **Thursday**: Explosive power drills (e.g., box jumps, hurdle jumps) - **Friday**: Circuit training (squats, lunges, standing jumps, core exercises) 3. Cool-down: Jogging, static stretching (10 minutes)
Week 4	**Strength and Stability** **Focus:** Strength improvement, stability during rotation, and landing mechanics Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training: - **Monday:** Strength training (squats, deadlifts, standing jumps). - **Tuesday**: Core stability exercises (planks, rotational exercises), balance drills. - **Wednesday**: Flexibility training (dynamic and static stretching). - **Thursday**: Landing mechanics drills (e.g., controlled landings from jumps). - **Friday**: Circuit training (squats, lunges, standing jumps, core exercises). 3. Cool-down: Jogging, static stretching (10 minutes)
Week 5	**Power and Precision** **Focus**: Increasing power, precision, and consistency in the tornado kick Daily training content: 1 Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training:

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Time	Contents
	- Monday: Power drills (e.g., box jumps, hurdle jumps), squats, and lunges - Tuesday: Core stability exercises (planks, rotational exercises), balance drills. - Wednesday: Flexibility training (dynamic and static stretching). - Thursday: Precision drills (e.g., slow-motion tornado kick, target practice). - Friday: Circuit training (squats, lunges, standing jumps, core exercises). 3. Cool-down: Jogging, static stretching (10 minutes).
Week 6	***Integration into Wushu Routines*** **Focus**: Integrating the tornado kick into Wushu routines, refining the technique Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training: - Monday: Full tornado kick execution, squats, and lunges. - Tuesday: Core stability exercises (planks, rotational exercises), balance drills. - Wednesday: Flexibility training (dynamic and static stretching). - Thursday: Integration drills (e.g., combining tornado kick with other Wushu movements). - Friday: Circuit training (squats, lunges, standing jumps, core exercises). 3. Cool-down: Jogging, static stretching (10 minutes).
Week 7	**Tornado kick skill and Speed** **Focus**: Increasing speed, explosiveness, and consistency Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes) 2. Main training: - Monday: Speed drills (e.g., short-distance sprints), squats, and lunges. - Tuesday: Core stability exercises (planks, rotational exercises), balance drills. - Wednesday: Flexibility training (dynamic and static stretching). - Thursday: **Tornado kick skill** - Friday: Circuit training (squats, lunges, standing jumps, core exercises). 3. Cool-down: Jogging, static stretching (10 minutes).
Week 8	**Refinement and Final Preparation** **Focus**: Refining technique, building confidence, and preparing for performance Daily training content: 1. Warm-up: Jogging, dynamic stretching (20 minutes). 2. Main training: - Monday: Lightweight strength training, dynamic stretching. - Tuesday: Full tornado kick execution, precision drills. - Wednesday: Competition simulation (full-range tornado kick), psychological preparation. - Thursday: Recovery training (jogging, static stretching). - Friday: Final tune-ups, confidence-building activities. 3. Cool-down: Jogging, static stretching (10 minutes).

Part 3: Confirm the effectiveness of the developed wushu training program by using an experimental method.

In this research, the training will be conducted for 8 weeks. The experimental group will use the developed wushu training program, while the control group will follow the traditional training program. Training will be conducted 5 days a week, with 2 hours per day. To determine the developed wushu training program to improve the tornado kick skill of students aged 7-9 years old, this research conducted the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test before the training, after 4 weeks of training, and upon completion of the 8-week training program. The results were as follows:

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Table 2 Mean and standard deviation of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test of the experimental group

Variables	Experimental Group					
	Pre-test		Mid-test		Post-test	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Tornado kick skill (score)	13.46	0.86	15.67	0.92	24.57	1.87
60-second sit-ups (time)	13.40	1.24	22.33	1.11	28.93	1.48
Sit-and-reach (cm)	3.00	0.84	5.73	1.03	9.33	1.23

Table 2 showed that the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test were conducted on the experimental group; the test results were 1) Tornado kick skill was pre-test $\bar{X}$ = 13.46 and SD = 0.86, mid-test $\bar{X}$ = 15.67 and SD = 0.92, and post-test $\bar{X}$ = 24.57 and SD = 1.87. 2) 60-second sit-ups was pre-test $\bar{X}$ =13.40 and SD =1.24, mid-test $\bar{X}$ = 22.33 and SD = 1.11, and post-test $\bar{X}$ = 28.93 and SD = 1.48. 3) Sit-and-reach was pre-test $\bar{X}$ = 3.00 and SD = 0.84, mid-test $\bar{X}$ = 5.73 and SD = 1.03, and post-test $\bar{X}$= 9.33 and SD =1.23, respectively.

Table 3 Mean and standard deviation of tornado kick skill test, 60-second sit-ups test, and sit-and-reach test of the control group

Variables	Control Group					
	Pre-test		Mid-test		Post-test	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Tornado kick skill (score)	13.61	0.84	14.49	0.81	20.82	1.30
60-second sit-ups (time)	13.33	1.11	19.66	1.63	23.66	1.58
Sit-and-reach (cm)	2.86	0.74	4.53	0.99	7.26	1.43

Table 3 showed that the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test were conducted on the experimental group; the test results were 1) Tornado kick skill was pre-test $\bar{X}$ = 13.61 and SD = 0.84, mid-test $\bar{X}$ =14.49 and SD = 0.81, and post-test $\bar{X}$ = 20.82 and SD = 1.30. 2) 60-second sit-ups was pre-test $\bar{X}$= 13.33 and SD = 1.11, mid-test $\bar{X}$ = 19.66 and SD = 1.63, and post-test $\bar{X}$ = 23.66 and SD = 1.58. 3) Sit-and-reach was pre-test $\bar{X}$ = 2.86 and SD = 0.74, mid-test $\bar{X}$ = 4.53 and SD = 0.99, and post-test $\bar{X}$= 7.26 and SD = 1.43, respectively.

Table 4 The comparison between the experiment and control groups with the pre-test results of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test, by t-test independent.

Variables	Exp. G		Cont. G		95% Confidence Interval of the Difference		t	p
	$\bar{X}$	SD	$\bar{X}$	SD	Lower	Upper		
Tornado kick skill (score)	13.46	0.86	13.61	0.84	-0.59	0.29	-0.72	0.48
60-second sit-ups (time)	13.40	1.24	13.33	1.11	9.25	1.05	0.14	0.88
Sit-and-reach (cm)	3.00	0.84	2.86	0.74	-0.64	0.91	0.36	0.71

*P<.05

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Table 4 showed that tornado kick skill, 60-second sit-ups, and sit-and-reach pairwise did not significant difference.

Table 5 The comparison between the experiment and control groups with the mid-test results of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test, by t-test independent.

Variables	Exp. G		Cont. G		95% Confidence Interval of the Difference		t	p
	$\bar{X}$	SD	$\bar{X}$	SD	Lower	Upper		
Tornado kick skill (score)	15.67	0.92	14.49	0.81	0.77	1.58	6.22	0.00
60-second sit-ups (time)	22.33	1.11	19.66	1.63	1.67	3.66	5.73	0.00
Sit-and-reach (cm)	5.73	1.03	4.53	0.99	0.28	2.11	2.80	0.01

*P<.05

Table 5 showed that tornado kick skill, 60-second sit-ups, and sit-and-reach pairwise had significant differences, p<.05.

Table 6 The comparison between the experiment and control groups with the post-test results of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test, by t-test independent

Variables	Exp. G		Cont. G		95% Confidence Interval of the Difference		t	p
	$\bar{X}$	SD	$\bar{X}$	SD	Lower	Upper		
Tornado kick skill (score)	24.57	1.87	20.82	1.30	2.90	4.58	9.53	0.00
60-second sit-ups (time)	28.93	1.48	23.66	1.58	4.05	6.47	9.32	0.00
Sit-and-reach (cm)	9.33	1.23	7.26	1.43	1.05	3.08	4.37	0.00

*P<.05

Table 6 showed that tornado kick skill, 60-second sit-ups, and sit-and-reach pairwise had a significant difference, p<.05.

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Table 7 The comparison of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test within the experimental group by using one-way ANOVA repeated measurement and Bonferroni post hoc.

Dependent variables / Test		Bonferroni			$\bar{X}$	SD	F	p
		Mean Difference	Std. Error	p				
Tornado kick skill test (score)								
Pre-test	Mid-test	-2.21	0.72	.00*	13.46	0.86	636.57	.00*
	Post-test	-11.10	0.41	.00*				
Mid-test	Pre-test	2.21	0.07	.00*	15.67	0.92		
	Post-test	-8.89	0.40	.00*				
Post-test	Pre-test	11.10	0.41	.00*	24.57	1.87		
	Mid-test	8.893	0.40	.00*				
60-second sit-ups test (time)								
Pre-test	Mid-test	-8.93	0.46	.00*	13.40	1.24	475.86	.00*
	Post-test	-15.53	4.96	.00*				
Mid-test	Pre-test	8.93	0.46	.00*	22.33	1.11		
	Post-test	-6.60	0.35	.00*				
Post-test	Pre-test	15.53	0.49	.00*	28.93	1.48		
	Mid-test	6.60	0.33	.00*				
Sit-and-reach test (cm)								
Pre-test	Mid-test	-2.73	0.18	.00*	3.00	0.84	255.36	.00*
	Post-test	-6.33	0.27	.00*				
Mid-test	Pre-test	2.73	0.18	.00*	5.73	1.03		
	Post-test	-3.60	0.21	.00*				
Post-test	Pre-test	6.33	0.27	.00*	9.33	1.23		
	Mid-test	3.60	0.21	.00*				

*P<.05

Table 7 showed that tornado kick skill, 60-second sit-ups, and sit-and-reach in the experimental group had a significant difference, p<.05, between pretest-midtest, pretest-posttest, and midtest-posttest.

Summary

The comparison of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test within the experimental group found that tornado kick skill, 60-second sit-ups, and sit-and-reach in the experimental group had a significant difference, p<.05, between pretest-midtest, pretest-posttest, and midtest-posttest. This indicates that the tornado kick skill, strength, and flexibility of the students in the experimental group before the training, after 4 weeks of the training, and after 8 weeks of training with the developed wushu training program had significant improvements at all time points.

Conclusion

The comparison between the experiment and control groups with the post-test results of the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test, by t-test, is independent. The results showed that tornado kick skill, 60-second sit-ups, and sit-and-reach pairwise were significantly different, p<.05. Therefore, the wushu training program effectively improved the tornado kick skill of students aged 7-9 years old.

Discussion

After the 8-week training period using the developed wushu training program, the students' tornado kick skill, strength, and flexibility showed significant improvement. This was evidenced by the enhanced results in the tornado kick skill test, 60-second sit-ups test, and sit-and-reach test of students in the

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experimental group. The tests were conducted before the training, 4 weeks into the training, and 8 weeks after the completion of the training.

As mentioned above, strength is one of the most important physical fitness components that contribute to the ability to perform the tornado kick skill. After 8-week training period, the strength of students in the experimental group better than the students in control group, this was evidenced by the comparison results in 60-second sit-ups test of students in the experimental group and control group, 60-second sit-ups test results were significant difference $p<.05$. These findings are consistent with the research conducted by Cheng,(2021) which indicated that the tornado kick starts with an explosive takeoff that demands significant lower body strength. The quadriceps, glutes, and calves are the key muscles responsible for generating the force needed to propel the body off the ground. Strong legs allow athletes to achieve the necessary height for rotation and generate momentum for the spinning motion. Without adequate strength, the jump may lack the power required, diminishing the effectiveness of the technique. In addition, Tian (2019) also indicated that a strong foundation of strength enables athletes to absorb the impact of landing while maintaining stability and preparing for subsequent movements. This is particularly crucial for young learners, who require extra support to develop coordination and balance. Repeated practice of the tornado kick can put strain on the body, especially in younger athletes. Building muscle strength not only enhances performance but also helps prevent fatigue during longer training sessions. Strong muscles offer better support to the joints, reducing the risk of injuries like sprains or strains.

Furthermore, flexibility is also considered one of the most important physical fitness components that helps to perform the tornado kick skill well. After 8-week training period, the flexibility of students in the experimental group better than the students in control group, this was evidenced by the comparison results in sit-and-reach test of students in the experimental group and control group, sit-and-reach test results were significant difference $p<.05$. These findings are consistent with the research conducted by Wang, (2021) emphasized that a well-executed kick requires a full range of motion to achieve both technical precision and aesthetic appeal. Flexible muscles and joints enable smooth, unrestricted movement, allowing athletes to lift their kicking leg higher with less effort and greater accuracy. Without sufficient flexibility, the kick may appear stiff or lack the necessary height for effective execution. Wushu places a strong emphasis on grace and elegance, with flexibility playing a crucial role in achieving this fluidity. The Tornado Kick involves a continuous transition from jumping to spinning and kicking, and flexible muscles help minimize resistance during these transitions, allowing the movement to flow seamlessly. This fluidity not only enhances the visual appeal of the technique but also ensures it meets the performance standards expected in competitions. Chan and Hong (2000) indicated that for young athletes aged 7-9 years old, flexibility is especially important as their bodies are still growing and developing. Regular flexibility training not only supports the mastery of the Tornado Kick but also enhances long-term athletic performance. A solid foundation of flexibility enables athletes to progress to more complex movements while reducing the risk of injury and wear on their bodies over time. Incorporating dynamic and static stretching routines into training helps these young learners establish a lifelong habit of maintaining flexibility, benefiting their overall physical fitness and sports performance.

Additionally, comparing the results of the tornado kick skill test between the experimental group and the control group in before training, after 4 weeks of training, and after completing 8 weeks of training revealed that the tornado kick skill of student in the experimental group better than the control group with significant difference $p<.05$. Therefore, the developed wushu training program can improve tornado kick skill of students aged 7-9 years old, consistent with the hypothesis that after 8 weeks of training, the tornado kick skill of students aged 7-9 years old in the experimental group who trained with the developed wushu training program was better than the control group that using the traditional training program, with the significance level at 0.05.

Recommendation

Recommendation for current research

1. To improve the validity and generalizability of the findings, it is recommended to expand the sample size beyond 30 students. A larger and more diverse sample would provide a broader understanding of the program's effectiveness across different learning styles, physical abilities, and developmental stages.
2. A follow-up study should be conducted several months after the training program to assess the long-term retention of the tornado kick skill and the overall impact on physical fitness and motor coordination. This would help determine the lasting effects of the Wushu training program on students

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Recommendation for further research

1. While the primary focus of the training is on physical skills, it is also important to track the psychological and emotional growth of students, such as increased confidence, perseverance, and self-discipline. These aspects contribute significantly to the overall effectiveness of the training and the students' motivation to continue learning.

2. Further research could explore the role of family involvement in the development of martial arts skills. Investigating whether parental support, including practicing at home, attending classes, and encouraging consistent practice, has a significant impact on the development of complex skills like the tornado kick could lead to more holistic training approaches.

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