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Development of Specific Physical Fitness Training to Improve Tennis Skills in Primary School Students in Guangzhou

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Abstract

Background and Aim: The research examines how specific physical fitness training improves tennis skills in primary school students in Guangzhou, focusing on strength and flexibility components. The research objectives were (1) to compare the effects of a specific fitness training program on improving tennis skills in primary school students between experimental and control groups. (2) to compare the effects of a specific physical fitness training program within the experimental group, pretest, midtest, and posttest. (3) to develop a specific physical fitness training program to improve primary school students' tennis skills.

Materials and Methods: This study was quasi-experimental research that used simple random sampling of subjects, who were 60 tennis students from the tennis club at Guangzhou Zhenguang Primary School. They were divided into the control and experimental groups with systematic sampling based on tennis skills score, each group with 30 people. They were pretested with tennis skills and specific fitness, and then the specific physical fitness training was conducted for the experimental group for an 8-week training duration, 3 days each week, and 120 minutes each session, and the normal training was conducted in the control group. Then posttest after training for week 4, 8. The mean and standard deviation, t-test, independent, one-way ANOVA repeated measurement, and Bonferroni post hoc were conducted for data analysis with the computer statistic package.

Results: The results found that (1) the mean comparison of tennis skills and specific fitness between experimental and control groups was significantly different (* p <.05). (2) Mean comparison within the experimental group on tennis skills and specific fitness, all variables pairwise with pretest, midtest, and posttest showed a significant difference (*P<.05). (3) The specific physical fitness training was highly effective, content validity was 89, and exercise drill, training load, and recovery time were appropriate for training.

Conclusion: The specific fitness training program significantly improved tennis skills and fitness levels in primary school students. The experimental group showed notable improvements in forehand/backhand skills, stroke speed, and specific physical fitness measures (push-ups, sit-ups, wall squats, sit-and-reach) compared to the control group, confirming the program's effectiveness.

Keywords: Specific Physical Fitness Training; Physical Fitness; Tennis Skills; Primary School Students

Introduction

In recent years, the development of young tennis players in Guangzhou has faced several challenges, particularly regarding their physical fitness, specifically strength and flexibility. These two components were crucial for enhancing groundstroke skills, which were fundamental to tennis performance. Research indicates that strength training not only improves on-court performance but also plays a significant role in injury prevention among young athletes (Zhengzheng Yu, 2024). Additionally, flexibility training is essential for optimizing stroke mechanics, allowing players to achieve a better range of motion and control during their swings (Lyle, 2023). A lack of focus on these fitness aspects can hinder the development of primary school tennis players, leading to suboptimal performance and increased risk of injuries. To address these issues, tennis coaches in Guangzhou should implement structured strength and flexibility training programs tailored to the needs of young players. Such programs can enhance their physical capabilities, thereby improving their groundstroke execution and overall game performance. By prioritizing these fitness components, coaches can foster a more robust athletic foundation for their players, ultimately contributing to their long-term success in the sport.

The improvement in groundstroke skills in primary school students through tennis training has evolved significantly over the past decade. Recent studies emphasize the importance of tailored training

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models that cater to the developmental needs of children aged 8-12 years. For instance, a study developed a training model based on the action method coaching framework, which was validated through expert feedback and field testing, demonstrating its feasibility for enhancing groundstroke skills in young players (Fauzi et al., 2021). Moreover, the use of modified equipment and scaled courts has been shown to facilitate skill acquisition by making the game more accessible and enjoyable for children. Research indicates that such adaptations not only improve technical skills but also enhance overall participation and enjoyment in tennis (Buszard et al., 2020). This aligns with the findings that integrating fun and engaging training methods can significantly boost children's motivation and skill development in tennis. To improve groundstroke tennis skills among primary school students, it was essential to focus on specific fitness components, particularly strength and flexibility. Research indicates that these physical attributes significantly enhance performance in tennis, especially for young players who are still developing their motor skills and physical capabilities.

The development of tennis skills, particularly groundstrokes, in primary school students is significantly influenced by their physical fitness, specifically strength and flexibility. Despite the recognized importance of these fitness components, there remains a notable research gap regarding their specific impact on young tennis players' performance. Current literature emphasizes the necessity of strength training and flexibility exercises in enhancing athletic performance across various sports, including tennis. For instance, studies have shown that strength training can lead to improved stroke power and consistency, while flexibility is crucial for executing effective groundstrokes without injury (Reid et al., 2021). However, much of the existing research focuses on adult athletes or elite junior players, leaving a void in understanding how these fitness elements specifically affect primary school-aged children.

Moreover, the application of age-appropriate training regimens that incorporate strength and flexibility exercises tailored to young athletes is underexplored. The unique physiological and developmental characteristics of children necessitate a distinct approach to training that considers their growth patterns and motor skill development (Crespo & Reid, 2020).

To address this gap, future research should investigate the optimal types and intensities of strength and flexibility training for enhancing groundstroke skills in primary school students. This could involve longitudinal studies that track the progress of young players over time, assessing how improvements in physical fitness correlate with skill development in tennis. In conclusion, bridging the research gap in this area is essential for developing effective training programs that can enhance the performance of young tennis players, ensuring they build a solid foundation for future success in the sport.

Objectives

The objectives of this study are as follows.

1. To compare the effects of specific physical fitness training to improve tennis skills in primary school students in Guangzhou between the experimental and control groups.

2. To compare the effects of a specific fitness training program within the experimental group, pretest, mid-test, and post-test.

3. To develop specific effects of specific physical fitness training to improve tennis skills in primary school students in Guangzhou

Literature review

The Specific Fitness Training for Improved Ground Strokes in Primary School Tennis Players:

Tennis requires a complex combination of physical attributes, including strength, flexibility, coordination, and cardiovascular endurance. For primary school tennis players developing fundamental ground strokes, specialized fitness training can significantly enhance performance and reduce injury risk. This review examines current literature on strength and flexibility training to improve forehand and backhand ground strokes in young tennis players.

Strength Training Components for Ground Stroke Development

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Research indicates that age-appropriate strength training can significantly benefit young tennis players. According to Fernandez-Fernandez et al. (2018), strength development in pre-adolescent athletes should focus on neuromuscular coordination rather than hypertrophy. Their study of 28 young tennis players (ages 9-12) demonstrated that twice-weekly resistance training using body weight and light resistance bands improved ground stroke velocity by 11% compared to control groups. Core strength plays a particularly vital role in ground stroke execution. Ellenbecker and Roetert (2019) found that rotational core strength directly correlates with forehand velocity in young players. Their research showed that exercises targeting the transverse abdominal muscles and obliques improved kinetic chain efficiency during the rotational movements essential for effective ground strokes. "Core strength provides the foundation from which power is generated and transferred through the kinetic chain during tennis strokes" (Ellenbecker & Roetert, 2019). Upper body strength training should focus on muscular endurance rather than maximum strength for primary school players. Murphy and Ramos (2021) demonstrated that moderate-intensity, higher-repetition exercises for the shoulders, chest, and back resulted in improved stroke consistency and reduced fatigue during extended rallies. Their 12-week intervention with young players showed that push-up variations and resistance band exercises particularly benefited backhand stroke production. Lower body strength is equally critical for ground stroke development. Kovacs et al. (2020) identified that exercises targeting the quadriceps, hamstrings, and glutes improved players' ability to maintain proper stance and weight transfer during ground strokes. Their study of 32 youth tennis players showed that simple bodyweight exercises, including lunges and squats performed 2-3 times weekly, improved balance during stroke execution by 17% and increased forehand power by 9%.

Flexibility Training for Enhanced Stroke Mechanics

Flexibility plays a crucial role in achieving optimal stroke mechanics. Whiteside et al. (2017) found that limited shoulder and thoracic spine mobility directly impacted backhand technique in youth players. Their analysis of 42 junior players revealed that those with greater rotational flexibility demonstrated more efficient stroke patterns and higher ball velocity.

Dynamic flexibility routines have shown superior results compared to static stretching before play. According to Behm and Chaouachi (2015), dynamic movement patterns that mimic tennis-specific actions increased the range of motion while simultaneously preparing neuromuscular pathways for performance. Their research indicated that young players who performed dynamic flexibility routines showed improved stroke accuracy with 14% fewer technical errors compared to those using static stretching alone.

For forehand development specifically, hip and trunk flexibility correlate strongly with proper technique. Fernandez-Garcia et al. (2023) demonstrated that limited hip mobility often results in compensatory mechanics during forehand execution. Their study of primary school tennis players showed that those following a targeted hip mobility program achieved greater rotation during the forehand and improved follow-through mechanics within eight weeks.

Integrated Approach to Training Young Players

The most effective programs integrate both strength and flexibility components in age-appropriate ways. Reid and Schneiker (2021) proposed a progressive model for primary school tennis players that begins with fundamental movement skills before advancing to tennis-specific training. Their longitudinal study following 48 young players over two years found that an integrated approach improved not only ground stroke performance but also overall athletic development. Training frequency and volume must be carefully considered for young athletes. Torres-Luque et al. (2018) recommend 2-3 sessions weekly of 20-30 minutes each, incorporating both strength and flexibility elements. This frequency provided optimal adaptation while avoiding overtraining in their sample of 56 primary school tennis players.

Conclusion

Research demonstrates that appropriately designed strength and flexibility training programs can significantly enhance forehand and backhand ground strokes in primary school tennis players. Effective programs should include core strengthening, upper and lower body resistance exercises using bodyweight or light resistance, and dynamic flexibility routines targeting the shoulders, trunk, and hips. These

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interventions should be age-appropriate, focus on proper technique rather than intensity, and be integrated with technical tennis training for optimal results.

Conceptual Framework

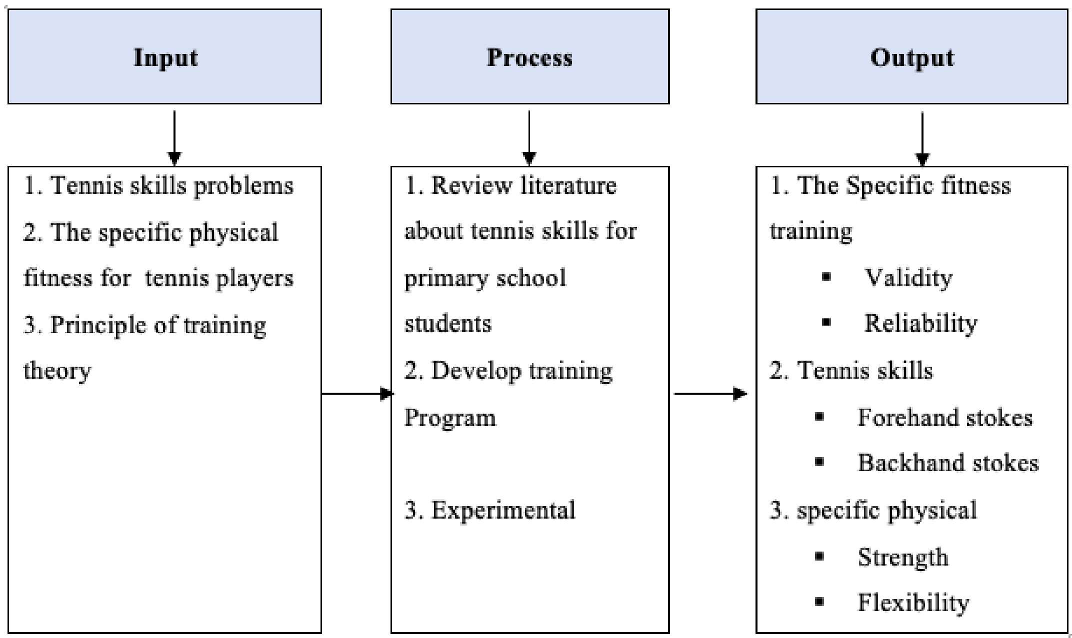

Figure 1 Conceptual Framework

Methodology

This quasi-experimental study, including experimental and control groups, was approved by the Committee for Research Ethics (social sciences), Faculty of Education, Bangkokthonburi University, BTUIRB No: 2567/216(4), dated December 16, 2567, and expiring December 15, 2569.

Population

The population of this study was 80 students of a tennis club in Guangzhou Zhenguang Primary School from September 2024 to December 2024. The students were aged 10-12 years old.

Sampling

The sample of this study included 60 fifth-grade male students from Guangzhou Zhengguang Primary School Tennis Club with simple random sampling. Then, systematic random methods through a cross-design method based on their tennis skill rankings were used to divide participants into two groups of 30 students each, and then the slot training method was applied to the experimental group and a control group.

inclusion criteria

1. Only students from the tennis club were allowed to participate.
2. Participants must be injury-free, as certified by a physician.
3. Participants must sign an informed consent form.

exclusion criteria

1. Participation in less than 80% of the training sessions during the 8-week experiment.
2. Failure to complete the test within the time specified by the researchers.
3. Participants who experienced health issues or injuries during the experiment and were unable to continue.
4. Participants who voluntarily withdrew from the study.

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Research design

The quasi-experimental research design in this study is as follows.

Experimental group	O_1	T_1	O_3	T_1	O_5
Control group	O_2	T_2	O_4	T_2	O_6

Note: O_1 refer to pretest of experimental group, O_2 refer to pretest of control group, O_3 refer to mid-test of experimental group, O_4 refer to mid-test of control group, O_5 refer to post-test of experimental group, and O_6 refer to post-test of control group, T_1 refer to training program of experimental group, and T_2 refer to training program of control group.

Research instrument

The research instrument in this study is as follows.

1. The specific physical fitness Training: The researcher developed both specific strength and flexibility training programs based on a literature review and theory to improve tennis skills, with an 8-week training duration conducted 3 days per week. The content validity of the training program was evaluated with an Index of item objective congruence (IOC) based on opinions from 3 experts (two tennis coaches and one sports scientist), which was found to be 0.98. To evaluate the appropriateness of the training program, tryouts were conducted with 3, 5, and 9 participants, which found that the exercise drills, intensity, and recovery time were appropriate for primary school students' training.

2. The tennis skills test that consisted of forehand and backhand ground stroke tests and forehand and backhand ground stroke speed tests with a radar speed gun, Bushnell Velocity Model 101911, made in China (Bushnell, 2024).

3. The specific fitness test that consisted of Push-up 30 sec (Hemara, 2017), Sit-up 30 sec (Hemara, 2017)., Wall squat (Wood, R. J., 2010), and sit and reach test (Hemara, 2017).

Data collection

1. Schedule appointments with the sample group to explain the guidelines, agreements, and procedures for conducting this research, and clarify any questions with the research assistants.

2. Collect basic characteristic data of the sample group and conduct pre-training tests, including tests for tennis skills, and fitness tests such as push-up tests, sit-up tests, wall squat, and sit and reach.

3. Conduct experiments by having the experimental group train according to the program created by the researcher, while the control group trains according to the original training program.

4. Conduct post-training tests in the fourth and eighth weeks, including tests for tennis skills and specific fitness tests.

5. Compile the data and proceed with statistical analysis.

Data analysis

The statistics in this study were as follows:

1. The mean and standard deviation of the variables.

2. Comparison of means between groups using an independent t-test.

3. Comparison of means within the experimental group using a one-way ANOVA with repeated measures, followed by post hoc analysis using Bonferroni.

Research process

This research followed a three-step methodology:

1. Document Analysis**:** Researchers conducted document analysis using training and document analysis factors to identify the need for an intervention program.

2. Program Development**:** The strength and flexibility training program was developed. The program was validated through content validity (IOC) and try-out phases to ensure effectiveness.

3. Experimental Evaluation**:** The final phase employed an experimental method comparing a control group with an experimental group to evaluate the program's impact on tennis skills and specific fitness.

This sequential design progressed from needs assessment through development to rigorous impact evaluation.

Results

The researcher had conducted data collection for statistical analysis and interpreted the results to meet the research objectives, as a table to accompany the essay, as follows:

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1) to compare the effects of a specific physical fitness training program on tennis skills in primary school students between experimental and control groups.

2) to compare the effects of a specific physical fitness training program on tennis skills within the experimental group, pretest, midtest, and posttest.

Table 1 Mean comparison between the experiment and control groups with the **posttest** of the tennis skills by an independent t-test.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	lower	Upper		
Forehand skill (score)	7.50±0.51	4.57±0.63	-3.22	-2.64	-19.92	.01*
Forehand stroke speed (km/h)	38.53±1.55	25.27±1.11	-14.97	-12.58	-38.12	.01*
Backhand skill (score)	7.57±0.63	5.00±1.05	-3.01	-2.12	-11.50	.01*
Backhand stroke speed (km/h)	38.20±1.97	25.13±0.82	-13.84	-12.28	-33.52	.01*

*P<.05

Table 1 showed that all of the tennis skills showed significant differences (*p<.05).

Table 2 Mean comparison between the experiment and control groups with the **posttest** of the specific fitness by an independent t-test.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	lower	Upper		
Push up 30sec (score)	23.74±1.31	14.27±0.70	-10.00	-8.93	-34.98	.01*
Sit-up 30sec (score)	24.90±1.13	15.80±0.56	-9.65	-8.56	-33.16	.01*
Wall squat (sec)	29.40±1.13	20.63±1.09	-9.35	-8.20	-30.43	.01*
Sit and reach (score)	10.94±1.37	2.50±0.50	-8.96	-7.90	-31.76	.01*

*P<.05

Table 2 showed that all specific fitness pairwise comparisons were significantly different (*P<.05).

Table 3 Mean comparison of tennis skills within the experimental group by using one-way ANOVA repeated measurement and Bonferroni post hoc.

Variables	Test		Bonferroni Mean Difference	Std. Error	p	M±SD	F	p
Forehand skills	Pre test	Mid test	-1.37	0.14	.01*	4.63±0.56	268.75	.05*
		Post test	-2.87	0.06	.01*			
	Mid test	Pre test	1.37	0.14	.01*	6.00±0.64		
		Post test	-1.50	0.15	.01*			
	Post test	Pre test	2.87	0.06	.01*	7.50±0.51		
		Mid test	1.50	0.15	.01*			
Forehand stroke speed	Pre test	Mid test	-5.93	0.67	.01*	25.27±1.11	1161.99	.01*
		Post test	-13.27	0.34	.01*			
	Mid test	Pre test	5.93	0.07	.01*	31.20±1.06		
		Post test	-7.33	0.33	.01*			
	Post test	Pre test	13.27	0.34	.01*	38.53±1.53		
		Mid test	7.33	0.33	.01*			
Backhand skill	Pre test	Mid test	-1.13	0.06	.01*	4.33±0.80	1218.17	
		Post test	-3.23	0.08	.01*			
	Mid test	Pre test	1.13	0.06	.01*	5.47±0.63		
		Post test	-2.10	0.06	.01*			.01*

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Variables	Test		Bonferroni Mean Difference	Bonferroni Std. Error	Bonferroni p	M±SD	F	p
	Post test	Pre test	3.23	0.08	.01*	7.57±0.63		
		Mid test	2.10	0.06	.01*			
Backhand stroke speed	Pre test	Mid test	-6.87	0.30	.01*	25.03±0.10	636.01	.01*
		Post test	-13.17	0.40	.01*			
	Mid test	Pre test	6.87	0.30	.01*	31.90±1.84		
		Post test	-6.30	0.39	.01*			
	Post test	Pre test	13.17	0.40	.01*	38.20±1.97		
		Mid test	6.30	0.39	.01*			

*P<.05

Table 3 showed that all of the tennis skill pairwise differences were significant (*p<.05).

Table 4 Mean comparison of specific physical fitness within the experimental group by using one-way ANOVA repeated measurement and Bonferroni post hoc.

Dependent variables	Test		Bonferroni Mean Difference	Bonferroni Std. Error	Bonferroni p	M±SD	F	p
Push up 30 sec(score)	Pre test	Mid test	-6.20	0.07	.01*	14.23±0.77	876.15	.01*
		Post test	-9.50	0.29	.01*			
	Mid test	Pre test	6.20	0.70	.01*	20.43±0.50		
		Post test	-3.30	0.29	.01*			
	Post test	Pre test	9.50	0.29	.01*	23.73±1.31		
		Mid test	3.30	0.27	.01*			
Sit-up 30sec (score)	Pre test	Mid test	-6.17	0.11	.01*	15.97±0.81	1410.51	.01*
		Post test	-8.93	0.17	.01*			
	Mid test	Pre test	6.17	0.11	.01*	22.13±0.82		
		Post test	-2.77	0.22	.01*			
	Post test	Pre test	8.93	0.17	.01*	24.90±1.40		
		Mid test	2.77	0.22	.01*			
Wall squat (sec)	Pre test	Mid test	-5.33	0.09	.01*	20.03±0.89	1030.58	.01*
		Post test	-9.37	0.22	.01*			
	Mid test	Pre test	5.33	0.09	.01*	25.37±0.56		
		Post test	-4.03	0.21	.01*			
	Post test	Pre test	9.37	0.22	.01*	29.40±1.13		
		Mid test	4.03	0.21	.01*			
Sit and reach (score)	Pre test	Mid test	-4.47	0.15	.01*	2.17±0.70	655.03	.01*
		Post test	-8.77	0.21	.01*			
	Mid test	Pre test	4.47	0.15	.01*	6.63±1.27		
		Post test	-4.30	0.32	.01*			
	Post test	Pre test	8.77	0.21	.01*	10.93±1.36		
		Mid test	4.30	0.32	.01*			

*P<.05

Table 4 showed that all of the specific physical fitness pairwise differences were significant (*P<.05).

Discussion

The results found that the tennis skills of the experimental group were better than the control group, and within the experimental group, posttest performance was better than midtest, which was better than pretest performance, respectively.

The results demonstrate that the experimental group significantly outperformed the control group in all tennis skill measurements. The experimental group showed superior performance in forehand skills

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(7.50±0.51 vs. 4.57±0.63), forehand stroke speed (38.53±1.55 km/h vs. 25.27±1.11 km/h), backhand skills (7.57±0.63 vs. 5.00±1.05), and backhand stroke speed (38.20±1.97 km/h vs. 25.13±0.82 km/h), with all differences being statistically significant (*p<.05). This substantial improvement can be attributed to several factors. First, the specific fitness training program implemented for the experimental group appears to have effectively targeted the physical components essential for tennis performance. The experimental group demonstrated significantly better results in all specific fitness parameters, including push-ups, sit-ups, wall squats, and sit-and-reach tests. These improvements in muscular strength, endurance, and flexibility directly translate to enhanced tennis performance (Fernandez-Fernandez et al., 2016). The push-up and sit-up improvements (23.74±1.31 vs. 14.27±0.70 and 24.90±1.13 vs. 15.80±0.56, respectively) indicate enhanced upper body and core strength, which were crucial for generating power in tennis strokes (Kovacs, 2007). The experimental group's superior wall squat performance (29.40±1.13 seconds vs. 20.63±1.09 seconds) suggests better lower body strength and endurance, essential for maintaining proper stance and generating ground force during strokes (Reid & Schneiker, 2008). Furthermore, the experimental group's significantly better flexibility, as measured by the sit-and-reach test (10.94±1.37 vs. 2.50±0.50), likely contributed to improved stroke mechanics and range of motion. Enhanced flexibility allows for better rotation during strokes and improved reach, particularly beneficial for primary school students developing proper technique (Behm et al., 2016).

The comprehensive nature of the specific physical fitness training program appears to have created a synergistic effect, where improvements in multiple fitness components collectively enhanced tennis skill acquisition and performance. This aligns with research suggesting that multifaceted training approaches were more effective than isolated skill practice for young athletes (Bompa & Buzzichelli, 2019). The progression within the experimental group that experimental group demonstrated consistent improvement across all testing phases (pretest, midtest, and posttest) in both tennis skills and specific fitness parameters, with all pairwise comparisons showing statistically significant differences (*p<.05). This progressive improvement pattern provides valuable insights into the effectiveness and time course of the training program.

For forehand skills, the experimental group progressed from 4.63±0.56 at pretest to 6.00±0.64 at midtest, and finally to 7.50±0.51 at posttest. Similarly, forehand stroke speed increased from 25.27±1.11 km/h to 31.20±1.06 km/h, and then to 38.53±1.53 km/h. This pattern of continuous improvement suggests that the training program effectively built upon previously developed skills and fitness levels (Lubans et al., 2010). The significant improvements between midtest and posttest (*p<.05 for all variables) indicate that the training program maintained its effectiveness throughout its duration, avoiding plateaus that often occur in skill acquisition (Schmidt & Lee, 2019). This suggests that the program's design incorporated appropriate progression and periodization principles, allowing for continued adaptation (Lloyd & Oliver, 2012).

The specific fitness components showed similar patterns of improvement. For example, push-up performance increased from 14.23±0.77 at pretest to 20.43±0.50 at midtest, and to 23.73±1.31 at posttest. These consistent improvements in fitness parameters likely facilitated the parallel improvements in tennis skills through enhanced physical capabilities (Behringer et al., 2011). The magnitude of improvement between pretest and midtest, compared to midtest and posttest, provides additional insights. For most variables, the improvement was greater in the first half of the program. This aligns with motor learning principles, suggesting that initial skill acquisition often shows rapid improvement, followed by more gradual refinement (Magill & Anderson, 2017). The continued improvement in the latter half of the program, despite the typically diminishing returns seen in training interventions, speaks to the effectiveness of the program design. This suggests that the training program successfully incorporated progressive overload principles and skill refinement techniques to maintain adaptation stimulus (Faigenbaum et al., 2009).

Conclusion

The study demonstrates that a specific physical fitness training program significantly enhances forehand and backhand ground strokes and fitness levels among primary school students. Results indicate notable improvements in forehand and backhand skills, stroke speed, and various fitness measures (push-ups, sit-ups, wall squats, and sit and reach) in the experimental group compared to the control group, confirming the program's effectiveness.

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Recommendation

In this study, we follow.

1. Long-Term Effects: Future research should investigate the long-term effects of the specific fitness training program on tennis skills and fitness levels to determine sustainability and retention of improvements over time.

2. Diverse Populations: The study should include a more diverse sample, encompassing various age groups, skill levels, and backgrounds to enhance the generalizability of the findings.

3. Qualitative Insights: Incorporating qualitative methods, such as interviews or focus groups, could provide deeper insights into participants' experiences and perceptions of the training program, enriching the quantitative data.

In the Future study

1. Expanded Training Programs: Future studies could explore different types of fitness training programs, comparing their effectiveness on tennis skills to identify the most beneficial approaches for young athletes.

2. Control for External Factors: Researchers should control for external factors, such as prior tennis experience and physical activity levels, to isolate the effects of the training program more accurately.

3. Cognitive Skills Development: While the study mentions the importance of attention, future research could delve deeper into the impact of specific cognitive skills training (e.g., decision-making, reaction time, tactical awareness) on tennis performance in young players. Exploring the cognitive dimension of tennis skill could lead to more targeted interventions that enhance strategic thinking and match-play capabilities. This builds upon the finding regarding attention levels and suggests a more in-depth exploration of cognitive factors.

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