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The Effects of Multi-ball Training Program on Badminton Skills of Male Students Aged Between 9-11 Years

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Abstract

Background and Aim: The multi-ball training method has proven to be effective in various coaching scenarios. It can be successfully utilized in one-to-one situations, such as private coaching, where a coach works with a single player. Multi-ball training is a method commonly used in various sports, including table tennis, tennis, and badminton, to enhance skill development and improve performance. The objectives of this research were: (1) To study the effects of a multi-ball training program on badminton skills of male students aged between 9-11 years, and (2) To construct the multi-ball training program for improving badminton skills of male students aged between 9-11 years.

Materials and Methods: This research is quasi-experimental. The population of this research was 37 male students aged 9-11 years of the badminton club in Huangdao District, Qingdao City. 26 male students who had never learned the basic skills of badminton before were selected in this research as a sample group (n=26). This research used a multi-ball training program that was developed by the researcher, and the IOC value was 0.89. The duration of the training was 8 weeks. One group pretest-posttest design was used to compare the results before training, after 4 weeks of training, and after finishing 8 weeks of training. The data was analyzed with mean, standardized, and One-way ANOVA repeated measures with a significant difference level was 0.05.

Results: The results showed that after the 8-week training using a multi-ball training program, it was found that the badminton skills of male students aged between 9-11 years improved in all four aspects, including the high clear shot, drop shot, smash, and serve skills. These skills showed statistically significant differences before receiving the training with the multi-ball training program, after completing the training in Week 4 and Week 8.

Conclusion: It can be concluded that the multi-ball training program developed by the researcher affects the development of badminton skills in male students aged between 9-11 years, which could improve the fundamental badminton skills of male students.

Keywords: Multi-Ball Training; Badminton Skills; Male Students Aged between 9-11 Years

Introduction

The multi-ball training method refers to a training approach in which coaches provide a continuous supply of balls to the players. This method involves using various combinations of techniques and adjusting factors such as ball speed, spin, and falling point based on specific training goals (Liu, W., & Ke, J., 2020). Turina (2002), Fullen (2011), and Letts (2013) indicated that the advantages of multi-ball training as follows: intense performance in a very short time – saving time for collecting balls – performing strokes in a very short time – increasing vital capacity and physical fitness – increasing or decreasing training load as needed – using different skills in the same framework.

According to Canada's Long-Term Athlete Development Model, children between the ages of 8 - 11 years old are considered the ideal age to learn “Fundamental Sport Skills”, this period is known as the “Learn to Train” stage. During the Learn to Train stage, boys aged 9-12 years and girls aged 9-11 years, this is the most important stage for the development of sport-specific skills as it is a period of accelerated learning of coordination and fine motor control (Canadian Sport Centres, 2016). Stewart, J. (2013) indicated that during this period, it is beneficial to offer active learning opportunities. Engaging children in hands-on events or activities that involve movement, rather than solely relying on passive sitting and listening, is highly recommended. Therefore, studying badminton training in 9-11-year-old students is important and greatly beneficial. Since children aged 9-11 are considered to be in the stage of learning skills and able to learn quickly, we can see the development of children's badminton skills, and then we can plan training programs to further develop their badminton skills in the future.

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Therefore, the researcher needs to study the effect of multi-ball training programs on the badminton skills of male students aged between 9 and 11 years. In this research, the researcher will focus on studying the effect of a multi-ball training program on the badminton skills of 9-11 years old male students, such as footwork, serve, high clear shot, drop shot, and smash, so this research aims to investigate how the implementation of multi-ball training can contribute to the improvement of badminton skills in this specific age group.

Objectives

The purpose of this research is to find out as follows:

1. To study the effects of a multi-ball training program on the badminton skills of male students aged between 9-11 years.

2. To construct a multi-ball training program for improving the badminton skills of male students aged between 9-11 years.

Literature Review

The multi-ball training method has proven to be effective in various coaching scenarios. It can be successfully utilized in one-to-one situations, such as private coaching, where a coach works with a single player. Additionally, it can also be applied successfully with a ratio of one coach to two players. Multi-ball training involves delivering balls with different spins, power, speed, and placement in various combinations. The continuous hitting of balls eliminates time wasted on ball retrieval, resulting in increased training intensity. Moreover, this method aids in enhancing the execution of drills by strengthening the execution of challenging movements. (Apostu, P., Nuț, R., & Baciu, A. 2018).

Multi-ball training is a method commonly used in various sports, including table tennis, tennis, and badminton, to enhance skill development and improve performance. It involves the use of multiple balls or shuttlecocks simultaneously during practice sessions, requiring the athlete to engage in rapid and continuous repetitions of specific techniques or exercises. The purpose of multi-ball training is to provide athletes with a higher volume of practice opportunities within a shorter period. This method helps players improve their hand-eye coordination, footwork, timing, shot accuracy, reaction speed, and overall consistency. By facing a continuous stream of shuttlecocks, players are forced to react quickly and efficiently, honing their technical skills and tactical decision-making abilities.

In Badminton, when the multi-ball training method is used in the training of badminton athletes, athletes can develop their basic skills and tactical, and also increase the training load, which has a strong impact on improving training effectiveness. This training method can effectively help the effectiveness and rationalization of technical movements. At the same time, it can improve the feeling of hitting the ball and the accuracy of the hitting point when hitting the ball (Wang Liang, 2020). When using the multi-ball training method, coaches require athletes to constantly pay close attention and make timely adjustments to their body positioning to prepare for hitting the shuttlecock. Before hitting the shuttlecock, athletes aim to quickly adjust their body posture by anticipating the shuttlecock's trajectory and speed. Meanwhile, through the process of training with the multi-ball method, athletes can continuously improve their physical fitness and coordination abilities (Li Jiali, 2020). Liu, D. (2020) indicated that the implementation of multi-ball training has shown promising results in enhancing the acquisition of basic badminton skills. This training method not only accelerates skill development but also reduces training duration. It effectively enhances movement coordination, agility, and footwork, leading to notable improvements in overall performance. However, it was found that the multi-ball training method was also designed for beginners to help them master the essentials of correct movements so that they can avoid mistakes in practice and gradually master standardized technical movements during continuous practice, for the future level of badminton to lay a good foundation (Liu, W., & Ke, J., 2020).

Wadea and Fekry (2002) indicated that multi-ball training demonstrates positive effects on various aspects of athletic performance in table tennis. The research findings suggest that this training method offers benefits in terms of aerobic and anaerobic endurance, muscular strength, flexibility, and

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agility. These improvements collectively contribute to enhancing overall performance in table tennis. Additionally, the study highlights that multi-ball training has a positive impact on the cardiopulmonary system. It enhances the ability of this system to supply oxygen to the muscles during performance, thereby aiding in sustaining optimal physical exertion.

Chen Yanze（2022) mentioned in the article "The effect of multi-directional movement training on the movement speed of badminton footwork" that multi-directional movement training plays an important role in the cultivation of badminton players and provides support for strengthening the movement speed of athletes' footwork. Badminton has strict requirements on the movement speed of athletes' footwork. Strengthening badminton footwork movement speed based on multi-directional movement training will help improve badminton players' sports competition ability from the perspective of improving physical fitness and stress response control ability so that badminton players can have a certain advantage in footwork movement speed.

Cao, B., (2021) indicated that the multi-ball training method is a method summarized and promoted by the domestic table tennis industry, it is very practical. Using the multi-ball training method in the table tennis teaching of primary school students can effectively improve the training efficiency and technical level of students. When using the multi-ball training method in table tennis teaching, significantly increases the intensity and density of students' physical activity. As a result, the physical fitness requirements for elementary school students are also relatively elevated.

Based on the relevant research studies, it has been found that multi-ball training methods have been applied in various sports, such as table tennis, tennis, and badminton. However, research on the effects of multi-ball training specifically for students aged 9-11 years is still very limited, the relevant research studies often focus primarily on teaching techniques and do not delve into the effects on skill development as a primary outcome.

Furthermore, because children between the ages of 9-11 years are at an appropriate stage to begin learning sports skills (Train to Learn stage), studying the effects of multi-ball training programs on the development of sports skills during this age range would likely provide clearer results.

Conceptual Framework

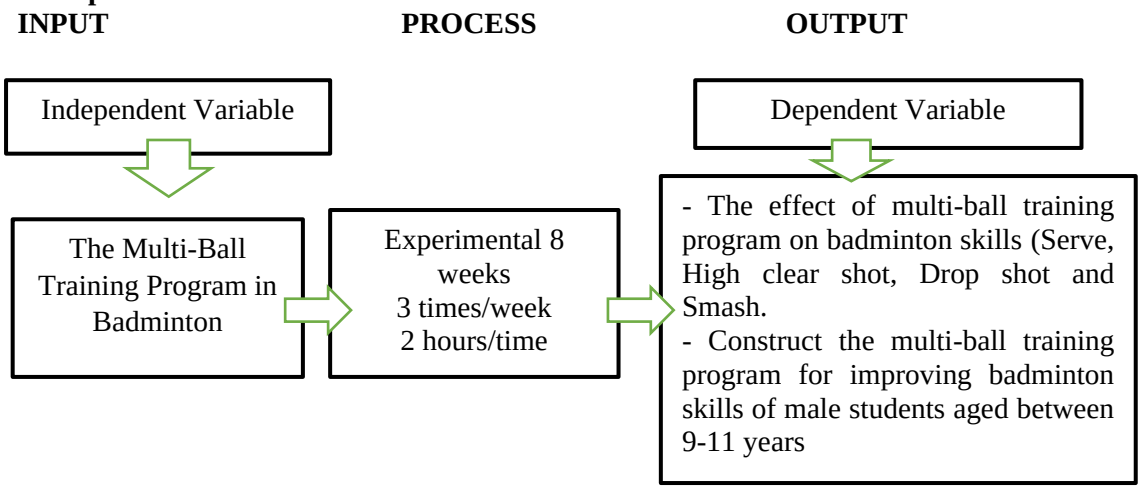

Figure 1: Conceptual framework of the research

Methodology

This research is Quasi-Experimental Research.

1. Population and Sample: Population specification and size, the population of this study is 37 male students aged between 9-11 years of the badminton club in Huangdao District, Qingdao City. Through the purposive sampling method, 26 male students were selected, and one group pretest-posttest

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design was used to compare the results before training, after 4 weeks of training, and after finishing 8 weeks of training. The sample group will not receive any badminton skill training before the experiment begins. However, the sampling technique, the purposive sampling method was used to select the sample for use in this research. The purpose of this research was to study the effects of multi-ball training programs on the badminton skills of male students aged between 9-11 years, so the researcher selects a sample based on the needs of the objective study.

2. Research Instrument

2.1 Interviewing form to collect the data from experts.

2.2 The badminton skills test is used to test the badminton skills of students. This test will be used before training with a multi-ball training program as a pre-test and then tested after 4 weeks of training, and after 8 weeks of training will be tested again as a post-test.

2.3 The multi-ball training program is a program developed by researchers. After studying the information regarding badminton skills training by using the multi-ball method from relevant documents and conducting interviews with experts, the multi-ball training program for training badminton skills was developed. The multi-ball training program will focus on the improvement of footwork, serve, high clear shot, drop shot, and smash. The duration of training is 8 weeks, frequency 3 times/week, 2 hours/time.

2.4 Developing and validating the multi-ball training program; (1) Determine the content validity of the multi-ball training program by 3 experts, and then calculate the Index of Item-Objective Congruence (IOC), the IOC value was 0.89. And (2) Develop and improve such a multi-ball training program by having another group of experts review it.

3. Data Collection: (1) Observation method and experts' interview method are used to design the multi-ball training program. (2) Before starting the experiment, conduct a pre-test by using a badminton skills test, and collect the test data. (3) Then proceed to the training by using a multi-ball training program. (4) After 4 weeks and 8 weeks of training proceed with the test according to 2 and collect the test data. (5) Prepare the collected data for statistical analysis and experimental results analysis.

4. Data Analysis: (1) Analyze the content validity of the training program by using analysis of the validity of the program: Indexes of Items of Objective Congruence (IOC). (2) Use Microsoft Excel to collect and organize the data obtained from the experiment. (3) Use package software to analyze the data. (4) Mean and standardized are used to examine. (5) One-way ANOVA repeated measures are used to compare pre-test results, after 4 weeks of training results, and post-test results within one group. And (6) the Significant difference level is 0.05.

Results

1. Introduction

The researcher researched the effects of a multi-ball training program on badminton skills. By developing a specific training program using the multi-ball method and implementing it during an 8-week training period with male students aged between 9-11 years.

The researchers conducted a badminton skills test of the male students aged between 9-11 years, a total of 3 times. The badminton skills test was conducted before the training, after 4 weeks of training, and after 8 weeks of the training. This is to study the development of badminton skills after receiving multi-ball training.

2. Detailed Analysis

2.1The results of the badminton skills test of male students aged between 9-11 years, who were in the sample group, before receiving the training with the multi-ball training program, after completing the training in Week 4, and after completing the training in Week 8, are as follows:

(1) The results of the high clear shot skill test are shown in Table 1.

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Table 1: The mean and standard deviation of high clear shot skill test of male students aged between 9-11 Years, as a sample group (n=26)

High clear shot skills test	**Mean (x̄)**	**Std. Deviation (SD)**
Pre-test	14.077	2.652
Week 4	24.462	3.036
Week 8	36.115	3.410

*N = 26

From Table 1, it is found that in the high clear shot skill test, using the badminton skills test, the total score was 50 points. The mean and standard deviation of the high clear shot skill test results of the sample group before receiving the training with the multi-ball training program were 14.077±2.652, after completing the training in Week 4 were 24.462±3.036, and after completing the training in Week 8 were 36.115±3.410.

(2) The results of the drop shot skill test are shown in Table 2.

Table 2: The mean and standard deviation of drop shot skill test of male students aged between 9-11 Years, as a sample group (n=26)

Drop shot skills test	Mean (x̄)	Std. Deviation (SD)
Pre-test	14.039	2.615
Week 4	23.731	2.808
Week 8	34.154	2.327

*N = 26

From Table 2, it is found that in the drop shot skill test, using the badminton skills test, the total score was 50 points. The mean and standard deviation of the drop shot skill test results of the sample group before receiving the training with the multi-ball training program were 14.039±2.615, after completing the training in Week 4 were 23.731±2.808, and after completing the training in Week 8 were 34.154±2.327.

(3) The results of the smash skill test are shown in Table 3.

Table 3: The mean and standard deviation of the Smash skill test of male students aged between 9-11 Years, as a sample group (n=26)

Smash skills test	**Mean (x̄)**	**Std. Deviation (SD)**
Pre-test	13.962	2.271
Week 4	26.115	2.046
Week 8	36.308	2.782

*N = 26

From Table 3, it is found that in the smash skill test, using the badminton skills test, the total score was 50 points. The mean and standard deviation of the smash skill test results of the sample group before receiving the training with the multi-ball training program were 13.962±2.271, after completing the training in Week 4 was 26.115±2.046, and after completing the training in Week 8 was 36.308±2.782.

(4) The results of the serve skill test are shown in Table 4.

Table 4: The mean and standard deviation of serve skill test of male students aged between 9-11 Years, as a sample group (n=26)

Serve skills test	**Mean (x̄)**	**Std. Deviation (SD)**
Pre-test	17.231	2.197
Week 4	26.385	2.127
Week 8	36.846	2.361

*N = 26

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From Table 4, it is found that in the serve skill test, using the badminton skills test, the total score was 50 points. The mean and standard deviation of the serve skill test results of the sample group before receiving the training with the multi-ball training program were 17.231±2.197, after completing the training in Week 4 was 26.385±2.127, and after completing the training in Week 8 was 36.846±2.361.

2.2 Comparison of the badminton skills test results between male students aged 9-11 years as a sample group before receiving the multi-ball training program, after completing the training in Week 4, and after completing the training in Week 8, using one-way repeated-measures ANOVA statistics, the result shown as follows:

(1) High Clear Shot Skill: comparison of high clear shot skill showed that there was a statistically significant improvement in the badminton high clear shot skill of male students aged 9-11 years in the sample group, between before receiving multi-ball training program, after completing the training in Week 4 and Week 8 [$F_{(2,50)} = 1188.158$, sig. =.000], as shown in Table 5.

Table 5: A comparison of badminton High clear shot skills among male students aged 9-11 years as a sample group, between before receiving the multi-ball training program, after completing the training in Week 4 and Week 8, using one-way repeated measures ANOVA

Source of Variance (Sov)	SS	Df	MS	F	Sig.
Time	6321.000	2	3160.500	1188.158	.000
Error	133.000	50	2.660		
Total	6454.000	52	3163.160		

** sig.=.000, SS = Sum of Square, MS = Mean Square

(2) Drop Shot Skill: A comparison of drop shot skill showed that there was a statistically significant improvement in the badminton drop shot skill of male students aged 9-11 years in the sample group, between before receiving the multi-ball training program, after completing the training in Week 4 and Week 8 [$F_{(2,50)} = 1159.007$, sig. =.000], as shown in Table 6.

Table 6: A comparison of badminton drop shot skills among male students aged 9-11 years as a sample group, between before receiving the multi-ball training program, after completing the training in Week 4 and Week 8, using one-way repeated measures ANOVA

Source of Variance (Sov)	SS	Df	MS	F	Sig.
Time	5262.487	2	2631.244	1159.007	.000
Error	113.513	50	2.270		
Total	5376.000	52	2633.514		

** sig.=.000, SS = Sum of Square, MS = Mean Square

(3) Smash Skill: comparison of smash skill showed that there was a statistically significant improvement in the badminton smash skill of male students aged 9-11 years in the sample group, between before receiving the multi-ball training program, after completing the training in Week 4 and Week 8 [$F_{(2,50)} = 1853.791$, sig. =.000], as shown in Table 7.

Table 7: A comparison of badminton smash skill among male students aged 9-11 years as a sample group, between before receiving the multi-ball training program, after completing the training in Week 4 and Week 8, using one-way repeated measures ANOVA

Source of Variance (Sov)	SS	Df	MS	F	Sig.
Time	6508.231	2	3254.115	1853.791	.000
Error	87.769	50	1.755		
Total	6596.000	52	3255.870		

** sig.=.000, SS = Sum of Square, MS = Mean Square

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(4) Serve Skill: comparison of serves skill showed that there was a statistically significant improvement in the badminton serves skill of male students aged 9-11 years in the sample group, between before receiving the multi-ball training program, after completing the training in the Week 4 and Week 8 [$F_{(2,50)} = 4269.318$, sig. =.000], as shown in Table 8.

Table 8: A comparison of badminton serves skills among male students aged 9-11 years as a sample group, between before receiving the multi-ball training program, after completing the training in Week 4 and Week 8, using one-way repeated measures ANOVA

Source of Variance (Sov)	SS	Df	MS	F	Sig.
Time	5009.333	2	2504.667	4269.318	.000
Error	29.333	50	0.587		
Total	5038.666	52	2505.254		

** sig.=.000, SS = Sum of Square, MS = Mean Square

3. Summary of the Results

After the 8-week training using a multi-ball training program developed by the researcher, it was found that the badminton skills of male students aged between 9-11 years in the sample group improved in all four aspects, including the high clear shot, drop shot, smash, and serve skills. There were statistically significant differences, indicating that there were significant differences in the average scores during each period.

Therefore, it can be concluded that the multi-ball training program in badminton, which the researcher designed, can improve the badminton skills of male students aged between 9-11 years.

Conclusion

The objectives of this research are (1) To study the effects of a multi-ball training program on the badminton skills of male students aged between 9-11 years, and (2) To construct the multi-ball training program for improving badminton skills of male students aged between 9-11 years.

The sample was 26 male students aged between 9-11 years who had never learned the basic skills of badminton. The research instrument used in this research is the multi-ball training program in badminton which was developed by the researcher, such research instrument has been quality checked and validated by experts and the IOC value was 0.89. The experiment was conducted at the badminton club in Huangdao District, Qingdao City. The total duration of the experiment was 8 weeks, 3 times a week, and 2 hours each time. The skills test will be focused on serve, high clear shot, drop shot, and smash.

The result showed that after 8 weeks of training with the multi-ball training program, the badminton skills of male students aged between 9-11 years in the sample group improved in all four aspects, including the high clear shot, drop shot, smash, and serve skills.

Discussion

After an 8-week training period using the multi-ball training program, the basic badminton skills of the 26 male students aged between 9-11 years, who served as the sample group in this research, showed significant improvement. This can be seen from the result of the pre-test, the result of the test after 4 weeks of training, and the result of the test after 8 weeks of training were significantly different. This finding is consistent with the research conducted by Liu, D. (2020) that the implementation of multi-ball training can quickly improve the grasp of basic badminton skills, shorten the training time, and effectively improve the movement, footwork, and mobilization skills, leading to notable improvements in overall performance. Wadea and Fekry (2002) indicated that multi-ball training demonstrates positive effects on various aspects of athletic performance. The research findings suggest that this training method offers benefits in terms of aerobic and anaerobic endurance, muscular strength, flexibility, and agility. These improvements collectively contribute to enhancing overall performance.

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From the results of this research, it can be concluded that the multi-ball training program developed by the researcher affects the development of badminton skills in male students aged between 9-11 years, which could improve the fundamental badminton skills of male students.

Recommendation

Expand the sample size: Consider including a larger number of participants to increase the statistical power and generalizability of the study's findings. Long-term follow-up: Extend the follow-up period beyond the 8-week training program to assess the sustainability of the skills improvement. This will provide insights into the long-term effects of the training program.

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