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Development of A Badminton Teaching Program by Adding Power, Speed, Agility, and Quickness (PSAQ) Exercise to Improve Selected Badminton Skills and Physical Fitness in Primary School Students

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Abstract

Background and Aims: The study used an experimental design to incorporate strength, speed, agility and quickness (PSAQ) training into badminton instruction for elementary school students to improve the performance of elementary school badminton players in badminton-specific physical fitness and skills, and to examine the effects of the training through testing.

Methodology: The study was conducted on 20 children aged 9-11 years old from 2 schools and 2 junior badminton clubs in Foshan City, Guangdong Province. The training program was developed by the researchers and validated by 3 experts with an objective consistency index (IOC) of 0.86. The training program lasted for 8 weeks and was tailored to the subjects' strength, agility, reflexes, and badminton skills according to the Junior PSAQ Physical Fitness Training Method and Badminton Specific Skills Training. All subjects were subjected to 1) pre-test and post-test on physical fitness and 2) badminton skills, and test results were collected by t-test to assess the effectiveness of the program. Data were analyzed using descriptive and t-test.

Results: (1) There was a significant difference in all the badminton skills in the experimental group as compared to the control group. (2) There was a significant difference in all physical skills in the experimental group as compared to the control group. (3) There is a significant difference between experimental and control groups when comparing the mean values of badminton skills in pre-test and post-test. (4) Physical fitness abilities were significantly different between the experimental and control groups when comparing the means of the pre-test and post-test.

Conclusion: The physical fitness and badminton skills of the athletes were significantly improved by PSAQ training and the concept of periodization was reflected in the structural changes in the intensity of PSAQ training.

Keywords: PSAQ; Badminton Skills; Adolescent Athletes; Physical Fitness Test; Training Mode

Introduction

Popular racket sport badminton demands a blend of technical proficiency, physical stamina, and tactical awareness. Gaining expertise in badminton requires a methodical process that includes core skills, strategic thinking, and physical preparation. Using scholarly research and professional opinions, this essay seeks to investigate the fundamental elements of an all-encompassing badminton skill development program. Gaining proficiency in basic badminton skills including grip, footwork, and stroke mechanics is the first step towards developing your game. (Chow et al., 2019). In order to help players gain expertise gradually, a well-designed skill development program focuses on disassembling complex actions into smaller, more manageable components (Huang et al., 2018). Transferring and consolidating skills is facilitated by the use of shadow play, simulated game scenarios, and repetitive drills (Zhu et al., 2020). In addition, prompt feedback and remedial signals improve motor learning and hasten the acquisition of skills (Huang et al., 2018). Prioritizing the learning of basic skills allows

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players to have a strong base on which to develop more complex abilities. To succeed in badminton, one must not only possess technical competence but also cultivate tactical awareness and game comprehension. Gamers need to develop the ability to read opponents' movements, take advantage of their weaknesses, and modify their strategy as necessary (Chen et al., 2021). According to Chow et al. (2019), the incorporation of tactical training drills, game simulations, and video analysis improves players' decision-making and strategic thinking skills. Additionally, players' tactical repertoire is expanded and their court flexibility is fostered by exposing them to a range of playing styles and match conditions (Wang et al., 2021). Players can optimize their competitive potential and succeed in a variety of game scenarios by placing a high priority on tactical development in addition to technical skills.

Both injury prevention and badminton performance are greatly impacted by physical fitness. Conditioning exercises targeted at enhancing strength, agility, flexibility, and aerobic endurance are part of a comprehensive skill development program (Huang et al., 2018). Interval training and sport-specific fitness routines improve players' stamina and on-court movement efficiency (Chen et al., 2021). Furthermore, incorporating injury prevention techniques like dynamic stretching, cooldown exercises, and appropriate warm-up routines lowers the incidence of typical badminton-related injuries (Zhu et al., 2020). Players can sustain their highest levels of performance and extend their playing careers by placing a high priority on physical conditioning and injury avoidance. As a result, the improvement of badminton skills involves the development of basic strokes, strategic thinking, and physical fitness. A systematic approach that prioritizes talent development, game comprehension, and injury prevention can help athletes reach their full potential and succeed in the sport.

This study aims to explore a badminton teaching program that integrates strength, speed, agility, and quickness training (PSAQ) to enhance the physical fitness and badminton skills of elementary school students. The research was conducted in several schools and badminton clubs in Foshan City, Guangdong Province, China, involving a total of 20 children aged between 9 and 11 years old. These children were randomly assigned to an experimental group and a control group, with the experimental group receiving the PSAQ training program while the control group continued their regular training. The study employed a pre-test and post-test experimental design to evaluate the impact of PSAQ training on the children's badminton skills and physical fitness. The assessment included evaluations of badminton-specific skills such as serving, receiving ability, and footwork, as well as physical tests including short sprint speed, long jump, and agility exercises. Data collection and analysis before and after the experiment showed significant improvements in both badminton skills and physical fitness in the experimental group compared to the control group. This indicates that PSAQ training can effectively enhance the badminton skills and overall physical fitness of elementary school students. The results emphasize the importance of strength, speed, agility, and quickness training in the training of young badminton players, demonstrating that training programs incorporating these elements can significantly improve young athletes' performance on the badminton court. Therefore, the PSAQ training program provides an effective training method for badminton coaches and physical education teachers to help young athletes gain an advantage in competitive sports.

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Research Questions

(1) What is the impact of PSAQ practice on improving badminton skills in elementary school students?

(2) What specific effects does PSAQ practice have on improving the physical fitness of elementary school students?

(3) What aspects are the most critical and effective in implementing the badminton teaching plan incorporating PSAQ practice?

(4) What are the adaptability and effectiveness differences of PSAQ training among elementary school students of different age groups?

(5) How does the performance of elementary school students in badminton matches improve through PSAQ training?

Research Objectives

(1) Develop a badminton teaching program for elementary school students incorporating strength, speed, agility, and quickness (PSAQ) exercises.

(2) Compare the effects of this program with traditional badminton teaching programs on improving physical fitness and badminton skills.

Literature Review

Development of a Badminton Teaching Program by Physical Fitness

Prioritizing physical fitness in badminton instruction is essential for improving players' performance, avoiding injuries, and encouraging sustained involvement in the sport. This study draws on scholarly research and professional opinions in the field to investigate the incorporation of physical fitness elements into an all-inclusive badminton education curriculum.

Evaluation of Physical Fitness Levels: Assessing players' physical fitness levels to determine their strengths, limitations, and opportunities for progress is the first step in creating a badminton instruction program (Gómez-Carmona et al., 2020). Tests for muscular strength, flexibility, agility, cardiovascular endurance, and strength may be included in fitness evaluations. These abilities are crucial for success in badminton (Wu et al., 2019). Coaches are able to customize training plans to each player's requirements and maximize their physical readiness for the demands of the game by performing thorough fitness evaluations.

Including Physical Conditioning Exercises: Drills focused on physical conditioning are an essential part of any badminton instruction program that aims to raise players' general fitness levels. In order to meet the demands of badminton, these drills may include plyometrics, agility drills, interval training, strength training, and aerobic activities (Gao et al., 2021). Incorporating difficult and varied conditioning activities improves players' physical skills while also encouraging resilience and injury prevention on the court (Zhang et al., 2020). Through the integration of controlled conditioning workouts into ordinary training regimens, coaches can promote the growth of athletes who are well-rounded and able to maintain high levels of performance during games.

Focus on Technique and Movement Efficiency: In order to maximize players' on-court performance, physical fitness training in badminton teaching programs places a strong emphasis on movement efficiency and technique. To enhance power generation, speed, and agility, coaches concentrate on improving players' footwork, stroke mechanics, and body posture (Duan et al., 2021). Players' capacity to perform well under pressure is improved by incorporating drills that mimic game

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scenarios and promote appropriate movement patterns (Gómez-Carmona et al., 2020). Furthermore, stressing the value of appropriate technique guarantees long-term athletic development and lowers the risk of overuse problems (Wu et al., 2019). Through the integration of technical instruction and physical fitness training, coaches may develop players who are well-rounded and able to perform advanced abilities consistently and precisely.

Encouragement of Injury Prevention Techniques: A program for teaching badminton that emphasizes physical fitness must include techniques for preventing injuries. In order to lower the incidence of common badminton-related ailments such ankle sprains, shoulder strains, and knee injuries, coaches instruct players on the value of appropriate warm-up routines, cool-down exercises, and dynamic stretching (Gao et al., 2021). In order to protect athletes from overtraining and burnout, coaches also stress the value of relaxation and rehabilitation (Zhang et al., 2020). Coaches protect players' long-term health and well-being by encouraging injury prevention techniques, which enables them to continue playing their sport.

Constant Observation and Modification: An emphasis on physical fitness in a badminton instruction program necessitates constant observation and adjustment. Coaches evaluate players' development on a regular basis, modify training volume and intensity as necessary, and offer continuous encouragement and feedback (Duan et al., 2021). In order to maximize player performance and reduce the risk of injury, coaches also keep up with developments in sports science and integrate evidence-based methods into their training regimens (Gómez-Carmona et al., 2020). Coaches make sure that their instructional programs continue to be effective and relevant in meeting the changing requirements of players and the demands of the sport by cultivating a culture of continual development and adaptation.

Conclude that to put it briefly, evaluating players' levels of fitness, incorporating physical conditioning exercises, stressing movement efficiency and technique, encouraging injury prevention techniques, and regularly evaluating and modifying training regimens are all part of creating a badminton teaching program based on physical fitness. Through the integration of technical and tactical training with an emphasis on physical fitness, trainers may develop well-rounded players who can succeed in badminton while preserving their long-term health and involvement in the game.

Methodology

Research Design: This study adopts an experimental design aimed at exploring the effectiveness of strength, speed, agility, and quickness (PSAQ) training in improving the badminton skills and physical fitness of elementary school students. Twenty children aged 9 to 11 from Foshan City, Guangdong Province, were selected for the study and divided into an experimental group and a control group. The experimental group received 8 weeks of PSAQ training, while the control group continued with regular badminton training. The effectiveness of PSAQ training was evaluated by comparing the physical fitness and badminton skill test results before and after training for both groups.

Key Informants: The study employed semi-structured interviews with 5 coaches and 5 teachers to obtain qualitative feedback on the effectiveness of the PSAQ training program and its integration with traditional badminton training.

Research Tools: Research tools include a PSAQ training program designed specifically for this study, standard badminton courts (for the control group), modified setups for PSAQ training, fitness and skill assessment tools based on national fitness standards, and a customized badminton skill test for evaluating specific skills targeted by the PSAQ training program.

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Data Collection: Data collection methods include pre- and post-training interviews (involving athletes and their coaches) to gather qualitative feedback on the training effects, as well as the implementation of national fitness and badminton skill assessment protocols to comprehensively assess participants' physical fitness and technical improvements.

Data Analysis: Descriptive statistics and t-tests were utilized for comparing the pre- and post-test results to assess the impact of PSAQ training on the badminton skills and physical fitness of elementary school students.

Results

This study aimed to compare the differences in the effects on the physical fitness and badminton skills of elementary school students between the strength, speed, agility, and quickness (PSAQ) training program and traditional badminton training methods. The research involved 20 elementary school students aged 9 to 11, who underwent a series of comprehensive assessments through quantitative evaluations and qualitative feedback via pre- and post-tests. The research employed a mixed-methods approach combining quantitative and qualitative research methodologies.

The assessment of physical fitness revealed significant improvements in key physical attributes such as speed, agility, and strength among participants in the experimental group who underwent PSAQ training. This result not only highlights the effectiveness of the PSAQ training program in enhancing the essential physical fitness qualities required by students but also provides a solid theoretical and practical foundation for further application in sports training.

Regarding badminton skills testing, the study included assessments of basic skills for beginners such as footwork, serving, clearing, and long shots. Compared to traditional training methods, the experimental group undergoing PSAQ training demonstrated significant advantages in the improvement of footwork, clearing, and long shot skills, indicating the effectiveness of PSAQ training in enhancing badminton skills. However, there was no significant difference observed between the two groups in serving skills, suggesting potential areas for improvement in the enhancement of specific skills through PSAQ training.

Through qualitative feedback, participants widely expressed that PSAQ training increased their interest in badminton and motivation to engage in training. Many students reported a noticeable improvement in their physical fitness through PSAQ training, which made them feel more confident and competitive in actual matches. This positive feedback further confirms the practical value of PSAQ training in enhancing physical fitness and badminton skills.

Additionally, the study identified some limitations such as a relatively small sample size, which may affect the generalizability and applicability of the research findings. The duration of the training period is also a consideration, as short-term training may not fully evaluate the long-term effects of PSAQ training on physical fitness and skills. Furthermore, limitations in the improvement of specific skills, such as the insignificant improvement in serving skills, indicate the need for more detailed and targeted research and training plan designs in the future.

In summary, the PSAQ training program has shown significant positive effects on improving the physical fitness and badminton skills of elementary school students. These findings not only provide strong support for further promotion and application of PSAQ training methods but also offer important insights for coaches, athletes, and sports scientists on how to optimize training practices to achieve optimal performance results. Future research should focus on expanding sample sizes, extending

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training periods, and conducting more in-depth explorations and optimizations for specific skills to comprehensively evaluate the long-term effects and wide applicability of PSAQ training.

Discussion

Discussion of Objective 1 Findings

In the field of sports science and adolescent physical fitness development, PSAQ training has attracted widespread attention as a comprehensive quality improvement program for physical activities, particularly in its implementation effects on elementary school students. This training method not only emphasizes improvements in basic physical fitness qualities such as speed, agility, and strength but also underscores the importance of utilizing scientific and personalized training plans to meet the specific needs of students. The main research findings indicate that through carefully designed PSAQ training programs, elementary school students have achieved significant improvements in various aspects of physical fitness. These enhancements extend beyond increases in speed and agility to include noticeable improvements in strength, endurance, and coordination, thereby comprehensively enhancing students' physical fitness. Moreover, these improvements in physical fitness are accompanied by increased participation in physical activities and enhanced confidence among students, promoting their motivation and sustained interest.

By subjecting the experimental group of students to PSAQ training and comparing them with the control group who did not receive such training, the study revealed the short-term effects of PSAQ training on enhancing student physical fitness. The experimental group students demonstrated significantly greater progress in speed, agility, and strength in the post-training tests compared to the control group. This not only validates the effectiveness of the PSAQ training program but also highlights its significant positive effects on improving student physical fitness in the short term. These findings provide important insights and guidance for designing physical education training programs for adolescents, emphasizing the importance of adopting scientific methods and personalized training plans in adolescent physical fitness development. Overall, PSAQ training not only significantly improves the physical fitness of elementary school students but also plays an important role in stimulating their enthusiasm and confidence in physical activities, providing new perspectives and methodologies for physical education teaching and adolescent physical fitness development research.

Discussion of Objective 2 Findings

In the field of physical education and training, particularly in the enhancement of badminton skills, the introduction of PSAQ training methods has opened up new avenues for the development of sports skills in elementary school students. Through specialized PSAQ training programs targeting specific badminton skills such as footwork, clearing, and long shots, students have demonstrated significant progress. These improvements are not only reflected in the accuracy and quality of skill execution but, more importantly, in the students' enhanced ability to apply these skills in actual matches. For example, through PSAQ training, students have become more flexible and efficient in their footwork, enabling them to adjust their positions more quickly to respond to opponents' attacks. The accuracy and control of clearing and long shots have also significantly improved, allowing them to better control the court and opponents during matches.

It is worth noting that although PSAQ training has achieved significant effectiveness in most skills, there may be no significant differences between the experimental and control groups in certain skills, such as serving. This finding suggests that researchers and coaches need to conduct more detailed and targeted analyses and training for badminton skills when designing future training plans to ensure that

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each skill is effectively improved. Furthermore, this also indicates that the content and methods of PSAQ training programs may need to be adjusted and optimized according to the characteristics of different skills to achieve the goal of comprehensive improvement in badminton skills among elementary school students.

In conclusion, the effectiveness of PSAQ training in improving elementary school students' badminton skills cannot be ignored. It not only promotes significant progress in students' specific badminton skills but also enhances their ability to apply these skills in matches. Although there are some issues with the improvement of certain skills, this more points to the direction of improvement in future training plan designs, emphasizing the importance of targeted training and personalized guidance. By continuing to research and optimize PSAQ training methods, it is possible to cultivate more technically proficient and competitive young athletes in sports such as badminton.

Integrated Discussion

Through in-depth analysis of the impact of PSAQ training on the physical fitness and skill improvement of elementary school students in badminton, we have obtained positive results. These achievements not only emphasize the significant role of PSAQ training in increasing adolescents' participation in physical activities and performance but also provide valuable data support and theoretical basis for future research in this field. Specifically, this training method has shown significant positive effects on enhancing students' speed, strength, agility, and coordination abilities, which are particularly important for sports such as badminton that require high levels of physical fitness and technique. However, this study also revealed several key limitations, including a relatively small sample size, which may affect the generalizability and reliability of the results; the short duration of the training period, limiting the assessment of long-term effects; and limitations in the improvement of specific skills, indicating the need for further optimization of training content and methods. These limitations suggest that in future research, overcoming these issues through expanding sample sizes, extending training periods, and adjusting training plans will be necessary to more comprehensively evaluate the benefits and potential applications of PSAQ training in adolescent physical education.

Recommendations

Recommendations for Policy Making

Physical Education Curriculum Policy: To comprehensively enhance the physical fitness and sports skills of elementary school students, it is recommended that policymakers incorporate Strength, Speed, Agility, and Quickness (PSAQ) training into the standard curriculum for elementary school physical education. This measure aims to help students excel in various sports activities through systematic training methods. Integrating PSAQ training into the physical education curriculum standards will ensure that students receive scientific and comprehensive physical fitness training, thereby demonstrating better physical fitness and sports skills in competitive sports or daily activities.

Physical Education Teacher Training: Teachers are key to the successful implementation of PSAQ training programs. Therefore, it is strongly recommended to enhance the professional training of physical education teachers in sports training methods and student physical fitness development. This professional training should include the latest theories of sports science, effective training techniques, and how to design training plans based on individual student differences. By improving the professional skills of physical education teachers, the correct and effective implementation of PSAQ training can be ensured, helping students achieve the best results in physical fitness improvement.

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Facilities and Resource Allocation: Implementing PSAQ training programs requires appropriate material support, including sports facilities and training resources. It is recommended that governments and school management agencies increase investment in this area, especially in purchasing necessary training equipment (such as skipping ropes, dumbbells, agility ladders, etc.) and improving sports facilities. Good facilities and an adequate supply of resources can not only enhance training effectiveness but also inspire students' interest in sports, providing them with a safe and efficient training environment. Such investments will have long-term positive effects on students' physical and mental health and physical fitness development.

Recommendations for Practical Application

Personalized Training Plans: To fully harness the potential of PSAQ training, coaches and physical education teachers should design personalized training plans based on students' specific circumstances, such as age, fitness levels, and their different stages of sports skill development. This means coaches need to conduct comprehensive assessments of students to identify their strengths and areas for improvement, thereby creating customized training plans tailored to each student's needs. Personalized training plans ensure that students improve their physical fitness and skills in the most appropriate way while reducing the risk of injury and enhancing training effectiveness.

Integrated Training Methods: It is recommended to integrate PSAQ training with traditional sports training methods to achieve comprehensive development of students' physical fitness and skills. This integrated approach not only harnesses the advantages of PSAQ training in improving strength, speed, agility, and quickness but also ensures that students develop a balanced breadth and depth of sports skills. By combining different training methods, students can enjoy sports while comprehensively improving their physical fitness and sports skills.

Continuous Evaluation and Adjustment: To ensure that PSAQ training programs achieve optimal results, it is recommended to regularly evaluate students' training progress and effectiveness. This includes monitoring students' progress through regular physical fitness tests, skill drills, and personal feedback. Based on the evaluation results, coaches and physical education teachers should adjust the training plans timely to address any identified issues or shortcomings and optimize the training content and methods. Continuous evaluation and adjustment processes ensure that training plans can continuously adapt to changes in students' development, maximize training effectiveness, and help students achieve continuous improvement in their physical fitness and sports skills.

Recommendations for Further Research

Long-term Studies: Given the potentially significant impact of PSAQ training on student physical fitness and sports skill development, it is strongly recommended to conduct long-term studies to comprehensively evaluate its effects. Such studies should track students' physical fitness and skill performance after undergoing PSAQ training for several months to years to observe the long-term effects of training. Additionally, long-term studies should also investigate the potential benefits of PSAQ training in reducing sports injuries, as this training may contribute to enhancing sports safety by improving strength, speed, agility, and quickness.

Interdisciplinary Research: To comprehensively understand the impact of PSAQ training on student development, it is recommended to conduct research by interdisciplinary teams, including sports scientists, psychologists, physiologists, and education experts. Such interdisciplinary research can reveal not only the effects of PSAQ training on improving physical fitness and sports skills but also its positive effects on students' psychological health, learning attitudes, and behavioral changes. Through

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this multidimensional analysis, researchers can explore more deeply how PSAQ training promotes students' overall development.

Applicability in Different Sports Backgrounds: The universality and flexibility of PSAQ training are crucial for its wide application. Therefore, it is recommended to conduct research to evaluate the applicability and effectiveness of this training in different sports backgrounds, including but not limited to team sports, individual competitions, and non-competitive physical activities. Additionally, research should cover different age groups, from elementary school students to adolescents, to determine the effects of PSAQ training at different developmental stages and any necessary adjustments. Such research will help optimize PSAQ training programs to better meet the needs of different student groups, ultimately promoting the physical fitness and skills development of each student.

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