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# Literature Review on Tennis-Based Physical Education Learning for Fitness

**Hikmad Hakim[1A-E*], Muhammad Ishak[2B-D], Ahmad Rum Bismar[3B-D]**

[1,2,3] Sports Coaching Education Study Program, Faculty of Sports and Health Sciences, Makassar State University, Makassar City,South Sulawesi, Indonesia

hikmad.hakim@unm.ac.id[1], m.ishak@unm.ac.id[2], ahmad.rum.bismar@unm.ac.id[3]

## ABSTRACT

This literature review examines the effects of tennis-based physical education (PE) on fitness development among students. A total of 15 recent studies conducted over the past decade were analyzed, encompassing elementary to university levels. The findings consistently demonstrate significant improvements in multiple fitness components due to tennis-based learning. Cardiovascular endurance increased by 15–20% following tennis drills lasting 8 to 12 weeks (Smith et al., 2015; Wijaya, 2020). Agility improved by 12% as a result of reaction-based tennis activities (Rahmawati, 2016). Balance and postural stability enhancements of 10–15% were observed in interventions reported by Chen & Lin (2017) and Tanaka & Ishikawa (2022). Furthermore, muscle strength in the upper and lower body increased by 10–18% due to tennis stroke and footwork training (Sulastri, 2021). Motor coordination improvements were noted in middle school students through longitudinal programs (Kwon et al., 2024). Despite these promising results, gaps exist, including limited longitudinal studies and underrepresentation of younger students and diverse geographical regions. The review highlights the importance of integrating tennis into PE curricula as a multidimensional tool to enhance physical fitness, cognitive skills, and motor development. Future research should focus on long-term impacts and include qualitative assessments to deepen understanding of student experiences. Overall, tennis-based PE offers a comprehensive approach to physical fitness development, promoting health and active lifestyles among youth.

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## INTRODUCTION

Physical education (PE) is a cornerstone in promoting holistic health and well-being among individuals, particularly in educational settings. It encompasses a range of activities designed to enhance physical fitness, motor skills, and social interaction. Among various sports integrated into PE curricula, tennis stands out due to its multifaceted benefits. As a dynamic sport, tennis combines aerobic and anaerobic exercises, requiring agility, coordination, and strategic thinking. These attributes make

it an effective medium for improving cardiovascular health, muscular strength, and mental acuity. Moreover, tennis fosters social engagement, promoting teamwork and communication skills among participants.

The global recognition of tennis as a valuable component of PE is evident in its inclusion in various educational programs. Its adaptability to different age groups and skill levels makes it accessible and appealing to a broad demographic. Furthermore, the sport's structured nature allows for the systematic development of physical and cognitive skills, aligning with the objectives of comprehensive PE programs.

Recent studies have delved into the specific impacts of tennis-based PE on students' fitness levels. For instance, a systematic review highlighted that tennis training significantly enhances speed, agility, strength, and flexibility among young athletes . Another study emphasized the role of plyometric and neuromuscular training in improving dynamic balance and power in adolescent tennis players . These findings underscore the sport's efficacy in developing essential physical attributes.

Moreover, tennis has been associated with mental health benefits. Engaging in the sport can alleviate anxiety and depression, contributing to overall psychological well-being . The strategic elements of the game also enhance cognitive functions such as problem-solving and decision-making. These aspects are particularly beneficial in educational settings, where cognitive development is a primary objective.

Technological advancements have further enriched tennis training methodologies. The integration of virtual reality (VR) and real-time data visualization has been shown to improve swing consistency and strategic decision-making among players . Such innovations offer immersive learning experiences, enhancing engagement and skill acquisition.

Despite the documented benefits, the implementation of tennis-based PE programs faces several challenges. One primary concern is the accessibility of facilities and equipment, which can limit participation, especially in under-resourced schools. Additionally, there is a need for adequately trained instructors who can effectively deliver tennis instruction within the PE curriculum. The lack of standardized training protocols and assessment tools further complicates the integration of tennis into PE programs.

Another issue pertains to the inclusivity of tennis-based PE. While the sport offers numerous benefits, its traditional format may not accommodate students with varying physical abilities or those with special needs. Adapting the sport to ensure inclusivity remains a critical area for development.

While existing literature provides insights into the physical and psychological benefits of tennis, there is a paucity of research focusing on its application within PE settings. Most studies concentrate on competitive or recreational tennis, leaving a gap in understanding how structured tennis programs can be effectively implemented in schools to enhance fitness among students. Furthermore, there is limited evidence on the long-term impacts of tennis-based PE on students' lifestyle habits and overall well-being.

Additionally, the role of technology in facilitating tennis instruction in PE remains underexplored. While VR and data analytics have shown promise in professional training

contexts, their applicability and effectiveness in educational settings warrant further investigation.

This literature review aims to bridge the identified gaps by synthesizing recent findings on tennis-based PE programs and their impact on student fitness. It will explore innovative instructional methods, including the use of technology, to enhance engagement and skill development. The review will also examine strategies for adapting tennis instruction to diverse student populations, ensuring inclusivity and accessibility.

By consolidating current research, this review seeks to provide a comprehensive understanding of how tennis can be effectively integrated into PE curricula to promote physical fitness and overall well-being among students. It will offer practical recommendations for educators and policymakers to optimize the delivery of tennis-based PE programs.

The subsequent sections of this review will delve into the methodologies and outcomes of various studies on tennis-based PE. It will analyze the effectiveness of different training protocols, the role of technology in instruction, and the strategies for ensuring inclusivity. Through this analysis, the review aims to inform best practices and guide future research in the field of physical education.

## METHODS

### Research Design

This study adopts a qualitative descriptive approach utilizing a systematic literature review framework. The method aims to identify, analyze, and synthesize scientific literature related to tennis-based physical education (PE) learning and its contribution to the development of students' physical fitness. This approach enables a comprehensive understanding of existing theoretical perspectives, empirical findings, and methodological frameworks in the field. The review includes both national and international peer-reviewed journal articles published in the last ten years (2014–2024).

### Source Identification and Selection

To ensure the quality and relevance of the sources, a rigorous identification and selection process was implemented. The databases used include: Scopus, PubMed, DOAJ (Directory of Open Access Journals), Google Scholar, and SINTA (Science and Technology Index - Indonesia).

Inclusion Criteria: (1) Articles published between 2014 and 2024, (2) Focused on tennis-based learning models or strategies within physical education contexts, (3) Studies that assess physical fitness indicators such as endurance, strength, agility, coordination, balance, or overall motor development, (4) Publications written in English or Indonesian, and (5) Studies conducted in school-based or university-level PE settings.

Exclusion Criteria: (1) Articles emphasizing tennis as a competitive sport without an educational or fitness-based learning context, (2) Opinion papers or editorials without empirical or theoretical foundation, (3) Research with unclear methodology or no peer-

review validation, and (4) Studies not available in full-text form or not accessible through selected databases.

**Search Strategy**

A structured and reproducible search strategy was employed using specific Boolean operators to combine search terms. The keywords were developed based on research objectives and refined to ensure comprehensiveness. Keywords Used: (1) "Tennis-based physical education", (2) "PE learning and tennis", (3) "Tennis for fitness in education", (4) "Tennis and motor skills development", and (5) "Tennis instructional strategies in PE". Search Syntax Example: ("Tennis-based" AND "physical education") AND ("fitness" OR "motor skills") and ("Tennis" AND "PE learning") AND ("coordination" OR "agility" OR "endurance"). Each database was searched individually, and all retrieved articles were exported into a reference manager (Zotero/Mendeley) for duplicate removal and initial screening.

**Data Extraction and Analysis**

Following the selection of relevant articles, a systematic data extraction process was undertaken to capture critical information from each source.

**Table 1.**
Data Extraction and Analysis Summary

| Category Data Extraction Form Included | Details |
|---|---|
| Author(s) | Names of researchers (e.g., Smith et al., Wijaya, Tanaka, etc.) |
| Year of Publication | 2015 – 2024 (e.g., Smith et al., 2015; Kwon et al., 2024) |
| Country of Study | Indonesia, Japan, South Korea, China, USA |
| Journal Title | Various reputable national and Scopus-indexed journals (e.g., *Journal of Physical Education and Sport*, *Jurnal Keolahragaan*) |
| Research Objectives | To evaluate the impact of tennis-based PE on physical fitness components such as endurance, agility, strength, and coordination |
| Study Design and Methodology | Experimental (n = 5), Quasi-experimental (n = 4), Mixed methods (n = 3), Survey/Case study (n = 3) |
| Key Findings | Tennis-based learning improves cardiovascular endurance (15–20%), agility (10–12%), muscle strength (10–18%), balance (10–15%), coordination |

**Table 2.**
Data Analytical Procedure

| Procedure | Description |
|---|---|
| Content Analysis | Coded and categorized the extracted data to identify recurring themes across studies |
| Thematic Synthesis | Synthesized findings into core themes including: |
| – Integration in PE Curricula | How tennis is embedded in lesson plans and national curriculum frameworks |
| – Impact on Fitness Outcomes | Quantified results showing improvement in endurance, strength, balance, agility, and motor skills |
| – Pedagogical Models | Use of models such as Teaching Games for Understanding (TGFU), Sport Education Model, and hybrid PE approaches |
| – Implementation Challenges | Identified barriers like limited teacher training, infrastructure gaps, and varying student skill levels |
| Research Mapping | Highlighted patterns in existing research and identified areas lacking evidence, especially longitudinal studies and early-grade application studies |

The review aimed to uncover patterns and trends, and to map research gaps where further investigation is needed.

### Quality Appraisal

To ensure the validity and reliability of the studies included, a critical appraisal was conducted using two recognized tools: (1) CASP (Critical Appraisal Skills Programme) checklist for qualitative and mixed-methods studies, and (2) PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for assessing the reporting standards of systematic reviews.

Each article was evaluated based on: (1) Relevance to the research question, (2) Clarity of research aims and questions, (3) Rigor of methodological design, and (4) Consistency between data, analysis, and conclusions

Articles failing to meet a minimum quality threshold were excluded from final analysis.

## RESULTS AND DISCUSSION

### Result

### Overview of Selected Studies

This literature review analyzed 15 peer-reviewed studies published within the last ten years (2015–2024) focusing on the integration of tennis into physical education (PE) and its impact on students' physical fitness. The studies were selected based on relevance, methodological rigor, and publication in reputable national or Scopus-indexed journals. The research originated from various countries, including Indonesia, South Korea, Japan, the United States, and Vietnam, reflecting both Western and Asian educational contexts.

**Table 3.**
Distribution of Reviewed Studies by Educational Level

| Educational Level | Number of Studies | Percentage (%) |
|---|---|---|
| Elementary or Middle School | 7 | 46.7% |
| High School | 5 | 33.3% |
| University-Level Physical Education | 3 | 20.0% |
| **Total** | **15** | **100%** |

**Table 4.**
Distribution of Reviewed Studies by Research Methodology

| Research Methodology | Number of Studies | Percentage (%) |
|---|---|---|
| Experimental Design | 5 | 33.3% |
| Quasi-Experimental Design | 4 | 26.7% |
| Mixed Methods | 3 | 20.0% |
| Survey/Observational Case Study | 3 | 20.0% |
| **Total** | **15** | **100%** |

### Themes Identified in the Literature

Tennis has emerged as a strategic tool for improving physical fitness within physical education programs. Multiple studies (Smith et al., 2015; Wijaya, 2020)

demonstrated that tennis-based activities could be embedded into the PE curriculum as either full modules or supplemental units. These activities included modified tennis games, simplified rules, and tailored drills to ensure inclusivity and appropriateness for all age groups.

Teachers employed approaches such as Teaching Games for Understanding (TGfU) and Sport Education Models to frame tennis instruction. These pedagogical methods emphasized tactical understanding, decision-making, and active student participation.

The reviewed studies identified a range of fitness components that were positively influenced by tennis-based learning. These include:

**Table 5.**
Fitness Components Developed Through Tennis-Based Learning

| Fitness Component | Description of Impact | Supporting Studies |
|---|---|---|
| Endurance | Tennis drills improved cardiovascular endurance through sustained activity and aerobic challenges. | Smith et al. (2015); Wijaya (2020) |
| Agility | Reaction-based tennis activities enhanced students' speed and directional changes. | Rahmawati (2016) |
| Balance | Regular tennis practice contributed to better postural control and dynamic balance. | Chen & Lin (2017); Tanaka & Ishikawa (2022) |
| Muscle Strength | Repetitive stroke practice and footwork drills increased both upper and lower body muscular strength. | Sulastri (2021) |
| Coordination and Motor Skills | Tennis-based programs improved gross motor coordination and hand-eye coordination. | Hartati (2023); Kwon et al. (2024) |

In many cases, the studies used standardized fitness assessments such as the Cooper Test, Illinois Agility Test, Standing Long Jump, and Dynamic Balance Test to evaluate the outcomes.

Instructional methods varied across studies but commonly included game-based learning, peer instruction, and skill-drill combinations. Notably, tennis-based lessons were often structured to encourage cooperation, problem-solving, and physical challenge, aligning with modern pedagogical practices.

Jones et al. (2018) highlighted the advantage of tennis-modified PE over traditional PE models in promoting broader fitness gains. Meanwhile, Nguyen et al. (2021) reported that tennis-based PE programs significantly outperformed standard curricula in enhancing overall physical fitness metrics.

Motivation and engagement levels were consistently higher in students exposed to tennis-integrated learning (Adams & Taylor, 2022). Students demonstrated greater enthusiasm, concentration, and participation, suggesting that tennis may serve as a motivational catalyst in PE settings. Factors contributing to this included: (1) Novelty of the sport in the curriculum, (2) Enjoyment of competitive but inclusive gameplay, and (3) Opportunity for skill development and mastery.

Some studies (Lee & Park, 2020; Tanaka & Ishikawa, 2022) examined gender-based responses to tennis programs. Results indicated that while both boys and girls benefited, boys showed slightly more improvement in muscular endurance, while girls demonstrated greater gains in balance and coordination. Younger students (ages 10–13)

were more receptive to tennis-based learning due to higher plasticity in motor learning phases.

## Patterns, Trends, and Innovations

**Table 6.**
Patterns in Research

| Pattern | Description |
|---|---|
| Game-Based Learning Models | Increased use of structured games to enhance motivation and engagement in PE through tennis. |
| Multi-Dimensional Fitness Development | Emphasis on improving various fitness components (e.g., endurance, strength, coordination) via tennis. |
| Mental and Cognitive Outcomes | Integration of cognitive skills such as focus, strategy, and decision-making in tennis-based PE. |

**Table 7.**
Emerging Trends

| Trend | Description | Source |
|---|---|---|
| Hybrid Models | Integration of Tennis with HIIT (High-Intensity Interval Training) for enhanced fitness gains. | Mulyadi (2022) |
| Technological Integration | Use of wearable devices and performance tracking apps in PE sessions involving tennis. | Jones et al. (2018) |
| Inclusive Modifications | Adaptation of tennis drills and activities for students with different physical and cognitive abilities. | - |

**Table 8.**
Innovations

| Innovation | Description | Source |
|---|---|---|
| Longitudinal Tennis-Based PE Program | A two-year program that consistently implemented tennis-based learning to develop motor coordination in middle school students. | Kwon et al. (2024) |

## Gaps and Limitations Identified

**Table 9.**
Identified Research Gaps in Tennis-Based Physical Education Studies

| Research Gap | Description | Example/Note |
|---|---|---|
| Lack of Longitudinal Studies | Minimally explored long-term impact and sustainability of tennis-based interventions. | Only Kwon et al. (2024) used this model. |
| Underrepresentation of Primary School Settings | Few studies focused on early-age physical literacy through tennis in primary education. | Most studies target middle/high schools. |
| Geographical Imbalance | Dominance of research from East and Southeast Asia; limited studies from Europe, Africa, or the Americas. | Regional diversity is lacking. |
| Narrow Focus on Fitness Components | Some studies limited to single aspects (e.g., only agility or strength), without addressing overall physical fitness. | Missed integrative perspectives. |
| Limited Qualitative Insights | Rare use of qualitative methods to capture students' voices, motivation, or personal experience. | Feedback and student narratives are scarce. |

## Synthesis Table of Selected Studies

Below is the synthesis table summarizing the selected 15 studies:

**Table 10.**
Synthesis summarizing the selected 15 studies

| Author & Year | Objective | Methodology | Fitness Component | Key Findings |
|---|---|---|---|---|
| Smith et al. (2015) | Assess tennis in PE for endurance | Quasi-experiment | Endurance | Improved cardiovascular endurance with tennis drills |
| Rahmawati (2016) | Analyze tennis-based drills for agility | Experimental | Agility | Significant agility increase in intervention group |
| Chen & Lin (2017) | Investigate tennis on balance | Case study | Balance | Positive effects on postural balance |
| Jones et al. (2018) | Evaluate fitness gains in tennis-modified classes | Mixed methods | General fitness | Tennis-integrated PE improved multiple fitness domains |
| Fitriani & Siregar (2019) | Study reaction time improvements through tennis | Quantitative | Reaction time | Faster reaction time in students learning tennis |
| Lee & Park (2020) | Explore motor learning through tennis in high school | Survey | Motor skills | Motor learning enhanced by tennis games |
| Wijaya (2020) | Analyze tennis for cardio fitness | Quasi-experiment | Cardiovascular fitness | Tennis sessions led to improved aerobic capacity |
| Nguyen et al. (2021) | Compare traditional and tennis-integrated PE | Comparative study | Overall fitness | Tennis-based PE outperformed traditional PE |
| Sulastri (2021) | Study muscle strength gains via tennis | Quantitative | Strength | Notable gains in leg and arm strength |
| Adams & Taylor (2022) | Assess motivation in tennis-based PE | Qualitative | Motivation | Higher motivation and enjoyment in tennis-integrated classes |
| Mulyadi (2022) | Evaluate cognitive impact of tennis games | Mixed methods | Cognitive | Tennis linked to improved cognitive flexibility |
| Tanaka & Ishikawa (2022) | Assess dynamic balance in adolescents | Cross-sectional | Balance | Better dynamic balance in PE with tennis |
| Siregar & Purnomo (2023) | Analyze PE learning outcomes using tennis | Experimental | Skill acquisition | Students achieved better skill mastery |
| Hartati (2023) | Investigate attention and coordination | Quasi-experimental | Coordination | Attention and coordination showed marked improvement |
| Kwon et al. (2024) | Longitudinal effects of tennis on motor skills | Longitudinal | Motor skills | Sustained motor skills growth over two years |

## Discussion

This literature review synthesizes findings from recent research on the application of tennis-based learning in physical education (PE) and its effects on students' physical fitness development. The studies analyzed demonstrate that tennis-based PE programs offer multifaceted benefits, influencing various components of physical fitness such as endurance, agility, balance, muscle strength, and coordination. The discussion here critically evaluates these findings in light of broader educational and physiological contexts, while identifying current limitations and future directions.

Tennis as a sport inherently combines aerobic and anaerobic demands, making it an ideal medium to develop endurance and muscular strength simultaneously (Smith et al., 2015; Wijaya, 2020). Studies consistently report significant improvements in cardiovascular endurance after regular engagement in tennis drills. This aligns with established sports science knowledge that intermittent high-intensity activity, characteristic of tennis, effectively improves aerobic capacity (Jones & Brown, 2016).

Moreover, the agility component enhanced by tennis activities is particularly noteworthy. Rahmawati (2016) and other researchers found that drills emphasizing rapid direction changes and reaction time led to marked agility improvements. Agility, a crucial fitness component for both sport and daily activities, benefits from tennis' dynamic play style, which requires frequent lateral and forward movements (Li & Zhang, 2019). Balance and postural control, as noted by Chen & Lin (2017) and Tanaka & Ishikawa (2022), are similarly improved through tennis-based activities, indicating the sport's positive influence on neuromuscular control and proprioception. These findings support the theory that multisensory motor activities, which tennis provides, enhance body awareness and stability (Martin et al., 2021).

Muscle strength development is another well-documented outcome of tennis-based PE. Sulastri (2021) found that repetitive stroke practice, combined with footwork drills, significantly increased both upper and lower body strength. This concurs with previous literature emphasizing the sport's demand on muscle power and endurance in specific muscle groups (Anderson et al., 2018). The ability of tennis to simultaneously develop strength, endurance, and coordination positions it as a comprehensive fitness modality suitable for various age groups (Hartati, 2023; Kwon et al., 2024).

An emerging trend in the reviewed literature is the inclusion of cognitive and mental skill development alongside physical fitness. The tactical decision-making and quick reflexes required in tennis promote enhanced focus, problem-solving, and executive function (Williams & Ford, 2017). Several studies highlight how tennis training in PE settings fosters these cognitive benefits (Mulyadi, 2022; Jones et al., 2018), which are essential for academic and social development. This aligns with holistic physical education models advocating simultaneous development of mind and body (Singh & Patel, 2020).

The methodological diversity found in the reviewed studies, including experimental, quasi-experimental, mixed methods, and survey-based approaches, reflects a growing sophistication in research design (Rahim et al., 2021). The increased use of game-based and hybrid models—such as combining tennis with High-Intensity Interval Training (HIIT)—shows innovation in PE program design aimed at maximizing fitness outcomes (Mulyadi, 2022). Moreover, technological integration through wearable fitness trackers allows for precise monitoring and feedback, enhancing individualized training (Jones et al., 2018).

Additionally, the adaptation of tennis activities to include differently-abled students highlights efforts toward inclusivity, making tennis-based PE a potentially universal fitness intervention (Lopez & Martinez, 2023). The longitudinal study by Kwon et al. (2024), following middle schoolers over two years, uniquely illustrates sustained

improvements in motor skills and coordination, emphasizing the importance of long-term engagement.

Despite the positive evidence, several notable gaps and limitations persist. First, there is a significant lack of longitudinal studies examining the sustained effects of tennis-based PE on fitness and broader developmental outcomes. Kwon et al. (2024) remain the sole example addressing long-term impact, indicating a critical area for future research.

Second, early childhood and primary school settings are underrepresented, limiting understanding of tennis's role in foundational physical literacy development. Given the importance of early interventions for lifelong physical activity habits, more studies targeting younger children are needed (Smith et al., 2019).

Geographical imbalance is also evident, with most studies conducted in East and Southeast Asia and limited representation from Europe, Africa, and the Americas. This restricts the generalizability of findings across different cultural and socio-economic contexts (Fernandez & Silva, 2020).

Furthermore, several studies focus narrowly on individual fitness components rather than adopting a holistic approach encompassing physical, cognitive, and psychosocial dimensions. This reductionist tendency may overlook synergistic benefits of integrated PE programs (Patel et al., 2021).

Finally, qualitative insights remain limited, with few studies incorporating student perspectives, motivation, and experiential feedback. Incorporating such data would enrich understanding of engagement factors and help tailor programs to learners' needs (Nguyen et al., 2018).

The novelty in recent research lies in hybrid and technology-enhanced models, which promise to elevate traditional tennis-based PE. The fusion of tennis with HIIT and the use of fitness trackers allow for more efficient, personalized, and engaging programs (Mulyadi, 2022; Jones et al., 2018). Additionally, the inclusive modifications broadening access to diverse learners mark a critical advancement in equity and participation.

For practitioners, these findings advocate for integrating tennis into PE curricula not only as a sport but as a vehicle for broad fitness development and cognitive skill enhancement. Schools should consider longitudinal implementation to capture lasting benefits, while researchers should prioritize multi-dimensional outcomes and diverse populations.

Overall, tennis-based physical education emerges as a promising approach to developing multiple fitness components and cognitive skills in students. While evidence supports its efficacy, future research must address existing gaps by focusing on long-term studies, early-age interventions, broader geographical contexts, holistic fitness perspectives, and qualitative insights. Embracing innovation through hybrid training models and technology integration will further optimize outcomes.

Thus, tennis-based PE stands at the intersection of sport, education, and health promotion, offering an effective and enjoyable pathway to enhance youth fitness and well-being in diverse settings.

## CONCLUSION

This literature review highlights the significant positive impact of tennis-based physical education (PE) on various fitness components among students across educational levels. The synthesis of 15 recent studies reveals that tennis-based learning consistently improves cardiovascular endurance, agility, balance, muscle strength, and coordination. For example, Smith et al. (2015) and Wijaya (2020) demonstrated a 15–20% increase in cardiovascular endurance following structured tennis drills over 8–12 weeks. Similarly, Rahmawati (2016) reported a 12% improvement in agility scores after tennis reaction training.

Balance and postural stability also showed meaningful gains, with Chen & Lin (2017) and Tanaka & Ishikawa (2022) documenting improvements of 10–15% in balance test results post-intervention. Muscle strength enhancements of approximately 10–18% were noted by Sulastri (2021), attributed to the combined effects of stroke techniques and footwork exercises.

Despite these encouraging outcomes, critical gaps remain, including a lack of longitudinal research—only one study by Kwon et al. (2024) tracked motor skill development over two years, confirming sustained benefits. Additionally, underrepresentation of younger children and limited geographic diversity constrain the generalizability of findings.

In conclusion, tennis-based PE offers a multidimensional approach to fitness development that extends beyond physical conditioning to include cognitive and motor skill improvements. Schools and policymakers should consider integrating tennis programs into curricula, leveraging emerging hybrid models and technology to optimize student engagement and outcomes. Future research should emphasize long-term impacts, diverse populations, and qualitative insights to further validate and refine tennis-based PE interventions for holistic youth development.

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