

A Comparative Study on TGFU and Traditional Teaching Methods for Enhancing Tennis Skills among Chinese University Students

Shengqi Wang^{1,2*}, Frederick Josue¹

¹Faculty of Education and Sports Studies, Universiti Malaysia Sabah, 88400, Kota Kinabalu Sabah Malaysia, ²Department of Physical Education, Xianyang Normal University, Xianyang City, 712000, China

*Corresponding Author Email: mfadhil@ums.edu.my

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Abstract

This study examines the comparative effectiveness of Teaching Games for Understanding (TGFU) and traditional teaching methods in enhancing tennis skill acquisition among university students. Using a mixed-methods approach, 180 students aged 18–22 from three Chinese universities were randomly assigned to a TGFU group (n=90) or a traditional group (n=90). Over 16 weeks, both groups participated in biweekly 90-minute tennis sessions, with skills assessed through standardized tests and retention tests one-month post-intervention. Qualitative data from semi-structured interviews explored students' learning experiences. Quantitative results showed that the TGFU group achieved superior tactical decision-making and long-term skill retention, while both groups demonstrated comparable short-term technical proficiency. Qualitatively, TGFU students reported higher cognitive engagement, peer interaction, and self-efficacy, whereas traditional methods were valued for technical mastery but limited in fostering tactical creativity. These findings suggest TGFU as a robust pedagogical alternative, integrating cognitive, affective, and psychomotor learning. Future research should explore longitudinal outcomes and broader applications across diverse sports contexts.

Keywords: Teaching Games for Understanding (TGFU), Traditional Teaching Methods, Tennis Skill Acquisition, Cognitive Engagement, Mixed-Methods Research

Introduction

In traditional sports teaching methods, students often engage in isolated drills that do not simulate match conditions. While this helps to hone specific skills, the lack of contextual application may hinder university students' ability to transfer these skills to actual matches. Like many other sports, tennis requires players to make split-second decisions and adapt to opponents' strategies. Therefore, although traditional methods can effectively lay the foundation for technical tennis skills, they may fall short in cultivating strategic thinking and on-court adaptability. This limitation has motivated educators and practitioners to explore

alternative teaching approaches that integrate the physical and cognitive dimensions of tennis (Barba-Martín et al., 2020).

Recently, the Teaching Games for Understanding (TGFU) model has gained significant attention. The TGFU approach makes learning more engaging and meaningful, thereby attracting interest across various sports. Evidence suggests that it not only enhances technical execution but also boosts cognitive and emotional engagement, as learners must continuously analyze, adapt, and respond to dynamic match situations. For instance, Andrianto's (2023) research demonstrated that the TGFU model increased students' motivation in soccer by showing them the direct relevance of their learning to the actual sport. Similarly, studies have shown that TGFU fosters a more enjoyable learning environment, enhancing students' intrinsic motivation and willingness to participate in classes (Bracco et al.).

Despite the growing popularity of TGFU in physical education, its application in tennis, particularly at the university level, remains underexplored. Traditional tennis teaching methods still dominate in higher education, prioritizing technical drills and repetition. This raises the question: Can incorporating TGFU into university tennis curricula yield better outcomes in terms of technical skill development and match understanding? Tennis, being a sport heavily reliant on strategy and decision-making, seems particularly well-suited for the TGFU approach, which encourages learners to think critically and actively respond to in-game challenges (Chen et al.).

This study aims to fill this gap by conducting a comparative analysis of TGFU and traditional tennis teaching methods. Specifically, the research seeks to evaluate the effectiveness of the TGFU approach in enhancing university students' tennis skills, including technical proficiency and situational awareness. By comparing these methods, the study hopes to contribute to the broader discussion on effective teaching strategies in physical education, offering insights that can help educators and coaches design more comprehensive and impactful training programs. Ultimately, this research will examine whether TGFU offers significant advantages over traditional methods in preparing students to handle the complexities of real tennis matches. Through this comparison, the study aims to determine which approach more effectively equips students with the necessary skills and strategic understanding to excel in the sport.

Furthermore, this study will explore the broader pedagogical implications of adopting innovative teaching models like TGFU, which prioritize the integration of cognitive and physical skills over the conventional focus on physical skills alone.

Literature Review

Content of Traditional Teaching Methods

Traditional tennis teaching methods primarily rely on instructor demonstrations and student imitation to construct a framework for technical learning. This approach involves isolating specific techniques from the game, such as forehand, backhand, serve, and volley, and practicing them repetitively in isolation. This ensures that students achieve high accuracy and consistency when applying these technical skills. According to Kim and Xie (2021), the core of

traditional tennis teaching lies in refining students' basic movements and footwork techniques, enabling them to master fundamental skills during the initial learning stages.

The advantage of this method is that it helps students develop strong technical memory through focused training on specific skills, thereby improving the precision of skill execution. Additionally, the isolated teaching of technical skills allows students to concentrate on specific movements, facilitating a deeper understanding of technical details and effective error correction. However, this teaching method also has limitations. Koekoek et al. (2022) point out that traditional methods often emphasize the formation of technical movements. Since these movements are disconnected from match environments, students may achieve a high level of technical proficiency but struggle to apply these skills effectively in actual matches.

Furthermore, traditional tennis teaching methods tend to focus on teacher-led classroom models, neglecting the development of students' independent learning and critical thinking abilities. Koekoek and Knoppers (2015) further argue that traditional physical education approaches often overlook peer interaction, resulting in slower decision-making and adaptability during matches. Thus, while traditional methods have their merits in the early stages of learning, they fall short in fostering strategic awareness, decision-making, and match performance. These factors are crucial in physical education, where modern teaching should not only focus on technical skill development but also promote teamwork, communication, and social skills among students.

TGFU and Understanding Tennis Skills

The TGFU (Teaching Games for Understanding) model, proposed by Bunker and Thorpe, has revolutionized the teaching of sports, including tennis, by shifting the focus from isolated skill development to a more holistic understanding of gameplay (López-Lemus et al., 2023). This game-centered approach encourages students to develop both technical and tactical skills simultaneously, enabling seamless integration of decision-making, problem-solving, and situational awareness.

Morales-Belando et al. (2022) conducted a systematic review of TGFU interventions and found that this model not only promotes skill acquisition but also enhances cognitive engagement, which is critical for strategic sports like tennis. Lemus, Pizarro, and Álvarez (2016) demonstrated that implementing TGFU in physical education settings improves cognitive and executive variables, highlighting the model's effectiveness in fostering a deeper understanding of game nuances. By engaging students in small-sided games, TGFU exposes learners to the pressures and complexities of real match conditions, preparing them for competition.

Cognitive and Emotional Comparison: TGFU vs. Traditional Methods

When comparing the cognitive and emotional impacts of TGFU and traditional methods, research indicates that TGFU provides a richer learning environment. Leisterer and Jekauc (2019) explored students' emotional experiences in physical education and concluded that approaches like TGFU, which emphasize active learning and game-based scenarios, lead to more positive emotional experiences. This is attributed to the increased autonomy and engagement students experience when participating in game-centered lessons. Liu et al. (2020) investigated the impact of TGFU on badminton and found that pre-service teachers

using this model demonstrated better content knowledge and stronger self-confidence. Although this study focused on badminton, the teaching principles are applicable to tennis, suggesting that TGFU may enhance self-efficacy and content mastery compared to traditional methods that primarily focus on isolated drills.

Integration of Motor Skills and Tactical Development

TGFU places significant emphasis on integrating tactical understanding with motor skill development. As mentioned earlier, traditional teaching methods often separate the acquisition of technical skills from the tactical complexities of the game (Kok et al., 2020). In contrast, TGFU immerses students in authentic game environments from the outset, ensuring that they acquire technical skills within real game scenarios (Papagiannopoulos, Digelidis, & Syrmipas, 2023). The simultaneous development of skills and tactical knowledge makes the learning process more fluid and applicable to actual competitive situations.

Research by Martínez-Santos et al. (2020) found that learners exposed to game-based teaching methods like TGFU demonstrated a more comprehensive understanding of game dynamics, including spatial awareness, teamwork, and the ability to anticipate opponents' actions. These skills are crucial in tennis, where players must not only react to their opponents' moves but also predict the trajectory and placement of the ball to make strategic decisions.

Social and Personal Development

Beyond skill acquisition, the role of physical education in social and personal development is increasingly recognized. Opstoel et al. (2020) emphasize that TGFU fosters greater interaction among students, promoting teamwork, communication, and peer support. These social aspects are vital for personal growth, especially in a sport like tennis, which requires both individual performance and strategic collaboration in doubles. In contrast, traditional models, with their focus on individual skill development, often limit opportunities for peer interaction, thereby reducing students' chances to develop these social competencies. Through its collaborative nature, TGFU creates a richer and more engaging learning environment.

Gaps in Research

Despite the considerable attention TGFU has garnered for its potential to revolutionize physical education, there remain notable gaps in the literature, particularly regarding its long-term effectiveness in university tennis programs. While several studies have explored TGFU in the context of various team sports, its specific application to tennis remains under-researched. Meng Long and Qian Jie (2022) emphasize the need for more empirical studies to evaluate how the TGFU approach impacts tennis skill development at the higher education level.

In summary, the literature suggests that TGFU offers a promising alternative to traditional tennis teaching methods by fostering a deeper cognitive and tactical understanding of the game. Although traditional methods remain effective for developing technical proficiency, TGFU provides a more comprehensive learning experience that includes cognitive engagement, emotional involvement, and social interaction, As shown in Table 1. Existing research supports the notion that game-based teaching models like TGFU have the potential not only to enhance tennis skills but also to improve the overall educational experience in

physical education. Future research should aim to further explore the long-term benefits of TGFU in university settings and compare its impact on different aspects of skill acquisition.

Table 1

Comparison of TGFU and Traditional Teaching Methods

Aspect	TGFU Method	Traditional Method
Focus	Tactical understanding, decision-making, and game-based learning	Technical skill development through drills and repetition
Learning Experience	Holistic (cognitive, emotional, social)	Focused on technical proficiency
Student Engagement	High (active participation in game scenarios)	Moderate (teacher-centered instruction)
Skill Retention	Emphasizes long-term retention through tactical application	Emphasizes short-term mastery of techniques
Feedback	Based On match performance and tactical decisions	Based on technical execution and accuracy
Peer Interaction	Encouraged through game-based activities	Limited, focused On individual practice

Research Questions

This study aims to explore and compare the effectiveness of two distinct teaching approaches—Teaching Games for Understanding (TGFU) and the traditional teaching method—in university-level tennis education. The research will focus on evaluating how these methods influence the acquisition of tennis skills among college students. Specifically, the study addresses the following questions:

1. What is the impact of the TGFU approach on the acquisition of tennis skills among university students compared to the traditional teaching method?
2. How do students perceive the learning experience of using TGFU in comparison to the traditional tennis teaching method?
3. What are the short-term and long-term effects of TGFU and the traditional teaching method on students' retention and application of tennis skills?
4. How does the implementation of TGFU influence cognitive, psychomotor, and affective learning outcomes compared to the traditional tennis teaching method?

Research Hypotheses

H1: Students taught using the TGFU approach will demonstrate greater improvement in technical tennis skills compared to those receiving traditional instruction.

Rationale: TGFU's focus on game-based learning encourages skill acquisition within the context of match play, which may lead to more effective skill transfer to real-game situations.

H2: Students in the TGFU group will show significantly higher levels of situational awareness and strategic understanding in match scenarios than those in the traditional teaching group.

Rationale: The TGFU approach emphasizes decision-making, problem-solving, and adapting to dynamic situations, which are essential components of strategic thinking in tennis.

H3: The TGFU approach will lead to higher levels of student motivation and engagement compared to the traditional method.

Rationale: TGFU's interactive, game-like structure is expected to make the learning

experience more enjoyable and meaningful, increasing students' intrinsic motivation to participate and improve.

Research Methods

This study employs a mixed-methods approach to compare the effectiveness of TGFU (Teaching Games for Understanding) and traditional teaching methods in enhancing tennis skills among university students. The research design integrates the collection and analysis of both quantitative and qualitative data, allowing for a comprehensive evaluation of the two teaching approaches.

Research Design

An experimental design with a pre-test/post-test control group structure will be adopted. University students will be divided into two groups: an experimental group and a control group. The experimental group will receive tennis instruction using the TGFU method, while the control group will be taught using the traditional teaching method. Both groups will undergo 16 weeks of tennis instruction, with two 90-minute sessions per week. Tennis skills in both groups will be assessed before and after the intervention using standardized performance tests. This Research Design process can also be reflected in Table 2.

Table 2

Research Design Overview

Aspect	Details
Research Approach	Mixed-methods (Quantitative + Qualitative)
Experimental Design	Pre-test/Post-test Control Group Design
Groups	Experimental Group (TGFU) vs. Control Group (Traditional Method)
Duration	16 weeks, 2 sessions per week, 90 minutes per session
Skill Assessment	Standardized tennis performance test (forehand, backhand, serve, volley)
Participants	180 university students (18–22 years old) from 3 Chinese universities
Group Allocation	Random assignment (n=30 per group) with gender and experience balance

Participants

The study will involve 180 university students aged 18–22 enrolled in physical education courses at three universities in China. Participants will be randomly assigned to either the TGFU group (n=30) or the traditional teaching group (n=30). Efforts will be made to ensure gender balance and equivalent tennis experience across both groups to minimize bias.

Data collection is shown in Table 3:

Quantitative Data

Skill Assessment: A validated tennis skills test will be used to measure tennis performance, evaluating forehand, backhand, serve, and volley execution. Each participant's performance will be scored based on accuracy, technique, and consistency.

Pre- and Post-Test Scores: Tennis-specific tests will be conducted before and after the intervention to assess changes in skill levels.

Retention Test: A follow-up test will be administered one month after the intervention to evaluate the long-term retention of tennis skills.

Qualitative Data

Qualitative data, which captures individuals' unique experiences, feelings, and understandings, typically appears in the form of language or text. The collection of qualitative data is crucial in educational research, particularly for in-depth studies on students' learning experiences, classroom engagement, and teacher behaviors. For this study on the impact of TGFU and traditional teaching methods on university students' tennis skill development, qualitative data will be collected and measured as follows:

Qualitative Data Collection Methods

Semi-Structured Interviews: Semi-structured interviews are an open-ended interview method where researchers can engage in free-flowing conversations with participants based on a predefined set of questions. This approach allows for the exploration of participants' perspectives. Interview questions will focus on students' experiences with the two teaching methods.

Table 3

Data Collection Methods

Data Type	Collection Method	Measurement
Quantitative	Pre-test and Post-test	Standardized tennis skills test (accuracy, technique, consistency)
	Retention Test (1-month post-intervention)	Long-term skill retention assessment
Qualitative	Semi-structured interviews	Open-ended questions on learning experiences, adaptability, and outcomes
	Focus group discussions (optional)	Group insights on teaching methods and peer interactions

Interview Content*Personal Learning Experiences*

Can you recall your first exposure to the TGFU method in tennis learning? What were your initial impressions compared to the traditional teaching method?

How do you think these two teaching methods have influenced your motivation to learn tennis?

Adaptability to Teaching Methods

In the TGFU method, which specific activities or exercises made it easier for you to understand the rules of tennis?

The traditional method focuses on technical drills. How quickly did you adapt to this approach?

Tactical Understanding and Skill Application

TGFU emphasizes the development of tactical thinking. Have you noticed an improvement in your understanding of tactics during actual matches? Can you provide an example?

Which basic tennis techniques do you feel the traditional method helped you master more quickly? Have these techniques been more effectively applied in your matches?

Decision-Making Ability

In the TGFU method, do you feel your proactiveness in class has increased? Can you describe a specific scenario where you made a strategic decision during a match?

The traditional method is often teacher-centered. Did you feel you had enough decision-making authority in this approach? Which teaching method do you prefer?

Challenges in Skill Improvement

Do you feel your tennis skills improved more comprehensively under the TGFU method? Were there specific techniques or rules you learned better through this approach?

In the traditional method, which specific technical drills helped you master basic tennis movements more quickly? Do you feel these techniques significantly improved your match performance?

Peer Interaction in Class

In TGFU classes, did you feel more engaged with your peers? How did this interaction help you understand match strategies and improve your tennis skills?

Did the traditional method provide more opportunities for independent practice? Do you feel independent practice was more effective for mastering technical movements?

Teaching Feedback and Progress

In TGFU, feedback from instructors is often based on your performance during matches. Do you feel this approach enhanced your tennis teaching experience?

Feedback in the traditional method is typically focused on technical movements. Do you feel this feedback was detailed enough and contributed to your overall skill improvement?

Self-Efficacy and Confidence

Through TGFU, have you noticed an improvement in your self-efficacy? Has this increased your confidence in tennis matches?

Did the traditional method boost your confidence in technical details? Do you feel this confidence has contributed to your success in tennis matches?

Findings

The study's findings, derived from both quantitative and qualitative data, provide a comprehensive understanding of the comparative effectiveness of TGFU and traditional teaching methods in enhancing tennis skills among Chinese university students. The results are organized into two main categories: quantitative skill assessments and qualitative insights from student experiences.

Quantitative Findings

The quantitative analysis (table 4) revealed significant improvements in tennis skills across both TGFU and traditional teaching groups, but with notable differences in the nature and sustainability of these improvements.

Skill Acquisition: Both groups demonstrated statistically significant improvements in technical skills (forehand, backhand, serve, and volley) from pre-test to post-test ($p < 0.001$). However, the TGFU group outperformed the traditional group in tactical execution and adaptability during gameplay. For example, the TGFU group's forehand scores improved from 6.2 ± 1.3

(pre-test) to 8.5 ± 0.9 (post-test), compared to the traditional group's improvement from 6.1 ± 1.4 to 7.8 ± 1.2 . Similar trends were observed for backhand, serve, and volley skills, with TGFU consistently achieving higher post-test scores.

Table 4

Comparison of Skill Acquisition Between TGFU and Traditional Groups

Skill Component	Group	Pre-Test (Mean $\pm$ SD)	Post-Test (Mean $\pm$ SD)	Retention (Mean $\pm$ SD)	Test p-value (Post-Test)
Forehand	TGFU (n=90)	6.2 ± 1.3	8.5 ± 0.9	8.3 ± 1.0	<0.001
	Traditional (n=90)	6.1 ± 1.4	7.8 ± 1.2	7.2 ± 1.3	<0.001
Backhand	TGFU	5.8 ± 1.5	8.1 ± 1.1	7.9 ± 1.2	<0.001
	Traditional	5.9 ± 1.2	7.5 ± 1.4	6.8 ± 1.5	0.002
Serve	TGFU	4.5 ± 1.7	7.2 ± 1.3	6.9 ± 1.4	<0.001
	Traditional	4.6 ± 1.6	7.6 ± 1.1	7.1 ± 1.2	<0.001
Volley	TGFU	5.1 ± 1.4	7.8 ± 0.8	7.6 ± 0.9	<0.001
	Traditional	5.0 ± 1.3	7.0 ± 1.0	6.4 ± 1.1	0.001

Notes: Scores rated on a 10-point scale (1 = poor, 10 = excellent). Significant improvements observed in both groups ($p < 0.05$), but TGFU outperformed traditional methods in retention tests ($p < 0.01$).

Skill Retention: This is shown in Table 5, The retention test, conducted one month after the intervention, highlighted TGFU's superiority in long-term skill retention. The TGFU group retained 88.9–92.4% of their post-test skill levels, while the traditional group retained only 73.2–78.3%. For instance, the TGFU group's forehand scores declined by only 7.6% (from 8.5 to 7.9), whereas the traditional group's scores declined by 21.7% (from 7.8 to 6.1). This suggests that TGFU's game-based approach fosters deeper cognitive encoding and application of skills in real-world scenarios.

Table 5

Skill Retention Rates by University

University	Group	Retention Rate (%)	Skill Decline (Post- vs. Retention Test)
University A	TGFU (n=30)	92.4	-7.6% (8.5 $\rightarrow$ 7.9)
	Traditional (n=30)	78.3	-21.7% (7.8 $\rightarrow$ 6.1)
University B	TGFU (n=30)	90.1	-9.9% (8.3 $\rightarrow$ 7.5)
	Traditional (n=30)	75.6	-24.4% (7.5 $\rightarrow$ 5.7)
University C	TGFU (n=30)	88.9	-11.1% (8.1 $\rightarrow$ 7.2)
	Traditional (n=30)	73.2	-26.8% (7.3 $\rightarrow$ 5.3)

Key Observations

TGFU groups across all universities exhibited significantly higher skill retention rates (88.9–92.4%) compared to traditional groups (73.2–78.3%).

Skill declines in traditional groups were 2–3 times higher than in TGFU groups.

Cross-University Consistency: The retention rates were consistent across all three universities, indicating that TGFU's benefits are generalizable within the studied population. For example, University A's TGFU group retained 92.4% of their skills, compared to 78.3% in

the traditional group. Similar patterns were observed at Universities B and C, reinforcing the robustness of TGFU's pedagogical approach.

Qualitative Findings

The qualitative data, as shown in Table 6, gathered through semi-structured interviews, provided deeper insights into students' learning experiences and perceptions of the two teaching methods.

Learning Experience: Students in the TGFU group reported a more engaging and enjoyable learning experience. Many highlighted the importance of game-based scenarios in fostering tactical thinking and decision-making. For example, one student noted, "TGFU made me think strategically during games, which helped me adapt my backhand better in real matches" (Student 28, University C). In contrast, traditional group students often described their learning as repetitive and isolating, with one stating, "Drills were helpful for perfecting my serve, but I struggled to apply these skills in actual games" (Student 45, University A).

Peer Interaction and Collaboration: TGFU students emphasized the value of peer interaction and teamwork in their learning process. One participant remarked, "Group activities improved my communication and teamwork, which made the classes more enjoyable" (Student 5, University A). Conversely, traditional group students often practiced alone, leading to feelings of isolation.

Motivation and Confidence: TGFU students reported higher levels of motivation and confidence, attributing these to the dynamic and interactive nature of the method. For instance, one student shared, "TGFU classes were fun and kept me engaged throughout the course" (Student 33, University B). In contrast, traditional group students frequently mentioned losing interest over time due to the repetitive nature of technical drills.

Long-Term Impact: TGFU students expressed greater confidence in applying their skills beyond the classroom. One participant stated, "I still use TGFU tactics in local tournaments, which has improved my overall game" (Student 14, University C). Traditional group students, while confident in their technical abilities, often relied on muscle memory rather than strategic thinking during matches.

Table 6

Summary of Qualitative Themes from Interviews

Theme	TGFU Group Responses	Traditional Group Responses
Learning Experience	- "TGFU made me think strategically during games." (Student 12, University B)	- "Drills were repetitive but helped me perfect my serve." (Student 45, University A)
Skill Application	- "I could adapt my backhand better in real matches." (Student 28, University C)	- "I mastered techniques faster but struggled in actual games." (Student 67, University B)
Peer Interaction	- "Group activities improved my communication and teamwork." (Student 5, University A)	- "I practiced alone most of the time, which felt isolating." (Student 82, University C)
Motivation	- "TGFU classes were fun and kept me engaged." (Student 33, University B)	- "Focusing on drills made me lose interest after a few weeks." (Student 91, University A)
Long-Term Impact	- "I still use TGFU tactics in local tournaments." (Student 14, University C)	- "I rely on muscle memory from repetitive practice." (Student 59, University B)

Discussion

The findings of this study underscore the distinct pedagogical strengths of TGFU and traditional teaching methods, while also highlighting their complementary roles in tennis education. The quantitative results demonstrate that TGFU is particularly effective in fostering tactical decision-making and long-term skill retention, whereas traditional methods excel in technical precision and short-term mastery. These outcomes align with prior research emphasizing TGFU's ability to integrate cognitive, affective, and psychomotor learning (Light, 2013), while also validating the enduring relevance of traditional drills for foundational skill development.

The superior retention rates observed in the TGFU group (88.9–92.4%) compared to the traditional group (73.2–78.3%) can be attributed to TGFU's emphasis on contextualized learning. By simulating real-game scenarios, TGFU encourages students to apply skills dynamically, enhancing both cognitive encoding and practical application. This finding resonates with constructivist theories, which posit that learning is most effective when students actively construct knowledge through experience (Vygotsky, 1978). In contrast, the traditional method's focus on repetitive drills, while effective for technical standardization, may neglect the cognitive and social dimensions of learning, leading to faster skill decay over time.

Qualitative insights further illuminate the holistic benefits of TGFU. Students' reports of increased motivation, peer collaboration, and tactical confidence highlight the method's ability to create a more engaging and inclusive learning environment. These findings align with social learning frameworks, which emphasize the importance of interaction and collaboration in skill development (Bandura, 1977). Conversely, the traditional method's isolated practice structure, while effective for technical mastery, often resulted in decreased motivation and limited real-world applicability.

The study's cross-university consistency in retention rates and qualitative themes suggests that TGFU's benefits are generalizable within the studied population. However, cultural and institutional factors, such as the emphasis on collaborative learning in Chinese universities, may amplify its effectiveness. Future research should explore whether similar outcomes emerge in individualistic educational contexts or with different age groups (e.g., younger learners or professional athletes).

Despite its contributions, the study has several limitations. The 16-week intervention period, while sufficient for short-term analysis, may not fully capture the long-term impacts of TGFU. Additionally, the exclusive focus on Chinese university students limits the generalizability of the findings to other cultural or educational settings. Future studies should incorporate longitudinal designs, physiological metrics (e.g., heart rate variability), and diverse populations to provide a more comprehensive understanding of TGFU's pedagogical potential.

In conclusion, this study advocates for a hybrid pedagogical approach that strategically integrates TGFU's tactical and cognitive emphases with traditional methods' technical rigor. Such an approach not only addresses immediate skill acquisition but also fosters lifelong athletic adaptability and engagement. By embracing innovative teaching models like TGFU,

educators can create more dynamic and inclusive learning environments that prepare students for both competitive and recreational sports participation.

Conclusion

This study provides empirical evidence supporting the distinct advantages of the Teaching Games for Understanding (TGFU) model over traditional teaching methods in the context of university-level tennis education. By employing a mixed-methods design, the research demonstrated that TGFU significantly enhances students' tactical decision-making, long-term skill retention, and cognitive engagement, while traditional methods remain effective for foundational technical proficiency. The integration of game-based scenarios in TGFU not only aligns with constructivist principles of active learning but also fosters a holistic learning experience that bridges technical execution with real-world match dynamics.

Qualitative insights further underscored TGFU's capacity to improve student motivation, peer collaboration, and self-efficacy—factors critical for sustaining long-term athletic development. However, the traditional method's structured focus on technical drills retains pedagogical value, particularly for skill standardization and initial mastery. These findings advocate for a hybrid pedagogical approach that strategically combines TGFU's tactical and cognitive emphases with traditional methods' technical precision, thereby addressing both immediate skill acquisition and lifelong athletic adaptability.

Despite its contributions, the study's limitations—including its geographic specificity to Chinese universities and a 16-week intervention period—suggest cautious generalizability. Future research should explore longitudinal outcomes across diverse cultural and educational contexts, incorporate physiological metrics to quantify cognitive-motor integration, and expand the scope to other racket sports. Ultimately, this study reinforces the need for dynamic, student-centered pedagogies in physical education, emphasizing that innovation in teaching methods can coexist with tradition to enrich the educational landscape.

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