The Improvement Path of the Integrated Physical Education Training Model for Chinese Youth Tennis Talents from an International Comparative Perspective: Taking the Practice of Universities in Guangxi

Xiao Qin*, Hamdan Mohd Ali
Faculty of Education and Liberal Studies, City University, Petaling Jaya 46100, Malaysia
*Corresponding email: qinxiaotiyu6@163.com

Abstract

Against the background of intensifying global sports competition and the continuing advancement of China's sports-education integration policy, the cultivation of high-quality youth tennis reserve talents has become an urgent task. This study investigated 12 universities in Guangxi that offer tennis courses and adopted a mixed-methods design combining literature review, questionnaire survey, semi-structured interviews, field investigation, and logical analysis. A total of 120 student questionnaires were distributed and 115 valid responses were obtained. In addition, eight university tennis coaches were interviewed, on-site field investigation was conducted in eight universities, and online follow-up information was collected from the remaining four institutions. Drawing on the advanced experience of the European Union and the United States, this paper examines the current situation, major dilemmas, and restrictive factors of the integrated sports-education training model for Chinese youth tennis talents. The findings show that insufficient training venues (39.1%) and outdated or inadequate equipment (33.9%) remain major resource constraints, while 63.5% of respondents reported frequent conflicts between academic coursework and tennis training. The study also indicates weaknesses in coaching development and an overly competition-oriented evaluation system. On this basis, the paper proposes four improvement paths: Optimizing cross-departmental resource integration, constructing a collaborative academic-training curriculum system, strengthening the professional development of coaches, and establishing a diversified comprehensive evaluation system. This study enriches the theoretical discussion of sports-education integration in tennis talent development and provides a context-specific reference for improving university-based youth tennis training programs in China.

Keywords

Sports-education integration, Youth tennis, Reserve talent training, International comparison, Improvement path

Introduction

Research background

Tennis is a global competitive sport that requires long-term, systematic, and scientifically organized training. The cultivation of reserve talents is therefore fundamental to the sustainable development of tennis. In China, the continuing implementation of the sports-education integration strategy has gradually challenged the traditional model in which athletic training and academic education are separated. The older model is increasingly unable to meet the demand for compound talents who possess both athletic competence and academic literacy [1,2].

Guangxi has made progress in youth sport development because of its regional policy support and expanding higher-education system. However, in the specific field of youth tennis reserve talent cultivation, a number of practical problems remain prominent, including insufficient integration of educational resources, weak coordination between academic study and athletic training, and a relatively single training pathway [3].

From an international perspective, the European Union and the United States have accumulated rich experience in balancing athletic development with education. The EU emphasizes athletes' dual-career development

through cross-sectoral collaboration, while the National Collegiate Athletic Association (NCAA) system in the United States provides relatively mature rules for training-time management, academic eligibility, and coach development [4]. These international experiences provide valuable references for optimizing China's tennis talent training model.

Research gap and significance

Existing studies on sports-education integration in China have mainly focused on broad policy interpretation or on other ball sports, while research specifically addressing youth tennis talent development in the university context remains limited [5]. Even fewer studies examine how institutional arrangements, curriculum design, coaching development, and evaluation mechanisms interact in Guangxi universities. As a result, the practical barriers to implementing sports-education integration in this setting are still underexplored. This study addresses the gap by taking universities in Guangxi as a concrete case and combining questionnaire data, interviews, field investigation, and international comparison.

Theoretically, it extends discussion of sports-education integration to the field of tennis reserve talent cultivation. Practically, it identifies major bottlenecks in the current training model and proposes improvement paths that are more operational and context-sensitive than general policy statements. Rather than claiming direct nationwide applicability, this paper aims to provide a context-specific reference for similar university-based tennis training programs in China.

Research questions

Based on the above background and research gap, this study addresses the following questions:

(1) What is the current status of the integrated sports-education training model for youth tennis talents in Guangxi universities?

(2) What are the major dilemmas and restrictive factors perceived by student respondents and university coaches?

(3) What improvement paths can be proposed by combining empirical findings from Guangxi with international comparative experience?

Research methodology

Research sites and participants

This study focused on 12 regular universities in Guangxi that offer tennis courses, including Guangxi University, Guangxi Minzu University, Guangxi University of Chinese Medicine, Guangxi Medical University, and Nanning Normal University. The quantitative survey targeted student trainees who were enrolled in tennis-related courses or participated regularly in organized tennis training at the sampled universities.

A total of 120 student questionnaires were distributed and 115 valid questionnaires were returned, yielding an effective response rate of 95.8%. The valid sample included students from different academic years, which helped capture variation in training experience and academic pressure. Because the subgroup counts reported in the archived draft were internally inconsistent, this revised manuscript reports aggregate descriptive results only. Subgroup-level statistics should be restored only after the original dataset has been rechecked (Table 1).

Table 1. Overview of research sites, participants, and data collection.

Component	Scope/Number	Source	Purpose
Research sites	12 universities in Guangxi	Institutional sampling	Defining empirical setting
Student questionnaires	120 distributed; 115 valid (95.8%)	Questionnaire survey	Measuring student perceptions of resources, academic-training balance, and evaluation
Coach interviews	8 university tennis coaches	Semi-structured interviews	Identifying institutional barriers and reform needs
Field investigation	8 universities on site	Observation + inquiry	Assessing venue construction, facilities, and training organization
Online follow-up	4 universities	Online communication	Supplementing information from non-visited sites
Data analysis	Descriptive statistics + thematic analysis	Integrated analysis	Synthesizing quantitative and qualitative evidence

For the qualitative component, eight university tennis coaches with at least five years of tennis teaching or

coaching experience were selected for semi-structured interviews. These participants were directly involved in tennis teaching, training organization, or team management at the sampled universities.

Inclusion criteria and ethics

Student participants were included if they met three conditions: They were enrolled in a university tennis course or participated in organized tennis training, they had completed at least one semester of tennis learning or training experience, and they agreed voluntarily to participate in the survey. Questionnaires with substantial missing responses or obviously patterned answers were excluded from the valid sample.

Coach interviewees were required to have current responsibilities in tennis teaching or training and at least five years of university-level experience. All participants were informed of the purpose of the research before data collection. Participation was voluntary, and questionnaire responses and interview materials were anonymized and used only for academic research.

Research methods

First, a literature review was conducted through CNKI, university library resources, and relevant sport-education databases. More than 100 documents were initially retrieved, and 60 core documents, including journal articles, dissertations, and policy materials, were retained after relevance screening. The literature review provided the theoretical basis for the analytical framework.

Second, a questionnaire on the current status of tennis talent cultivation in Guangxi universities from the perspective of sports-education integration was designed in two versions: a student version and a coach version. The student questionnaire covered four core dimensions: resource allocation, curriculum and training arrangement, academic-training balance, and evaluation perceptions. The coach questionnaire focused on coaching experience, training methods, resource support, and evaluation criteria. Most items adopted structured categorical responses or Likert-style options. To assess reliability, a four-week test-retest procedure was carried out with 20 randomly selected respondents, producing a correlation coefficient of $R=0.89$. Content validity was examined by 10 experts, among whom 70.0% rated the instrument as "very effective" and 30.0% as "effective".

Third, semi-structured interviews were conducted with eight university tennis coaches. The interview outline focused on the current status of sports-education integration, major implementation problems, references from international practice, and suggestions for improvement. Interview records were transcribed and organized for qualitative analysis.

Fourth, field investigation was conducted in 8 of the 12 sampled universities through on-site observation and inquiry, focusing on tennis venue construction, facility provision, course implementation, and training organization. The remaining four universities were followed up through online communication so that the study could still obtain information about their tennis-training conditions.

Data analysis

The collected literature, questionnaire data, interview materials, and field notes were organized and analyzed in an integrated manner. Quantitative questionnaire results were summarized mainly through descriptive statistics, including frequencies and percentages. Given the exploratory purpose of the study and the inconsistency of subgroup counts in the archived dataset, this revision does not report inferential comparisons between sports majors and non-sports majors.

Qualitative interview data were analyzed using thematic analysis. After transcription, the interview materials were read repeatedly to identify meaning units, which were then coded and grouped into broader categories. The final themes were organized around four analytical dimensions: resource allocation, academic-training coordination, coaching development, and evaluation systems. The coding results were checked against the questionnaire findings and field observations to improve interpretive consistency.

Results

Current status and dilemmas of the sports-education integrated training model in Guangxi universities

(1) Resource allocation: structural imbalance and low utilization efficiency

The survey and field investigation show clear inequality in the distribution of tennis-related resources across the 12 sample universities. In this study, "structural imbalance" refers to uneven provision of courts, indoor

facilities, basic rehabilitation support, training equipment, and external cooperation opportunities among institutions. On-site investigation found that only six universities had standardized outdoor tennis courts with at least four courts, and only three universities had indoor courts together with basic fitness-training or rehabilitation facilities.

Among valid student respondents, 39.1% (n = 45) identified insufficient training venues as the main obstacle to their tennis development, and 33.9% (n=39) reported that equipment was outdated or inadequate.

Resource integration with external institutions was also weak. Only two universities had established preliminary cooperation with local tennis clubs, while most universities still relied mainly on internal arrangements. This limited both the use of social sport resources and the efficiency of university resource use.

(2) Academic training coordination: frequent conflicts and unbalanced development

Academic-training conflict emerged as one of the most prominent problems. Among the 115 valid student questionnaires, 63.5% (n=73) reported that they often encountered conflicts between academic coursework and tennis-training schedules. In addition, 39.1% (n=45) stated that they had skipped some classes because of training demands, and 24.3% (n=28) admitted that they had neglected homework or academic tasks during intensive training periods (Figure 1).

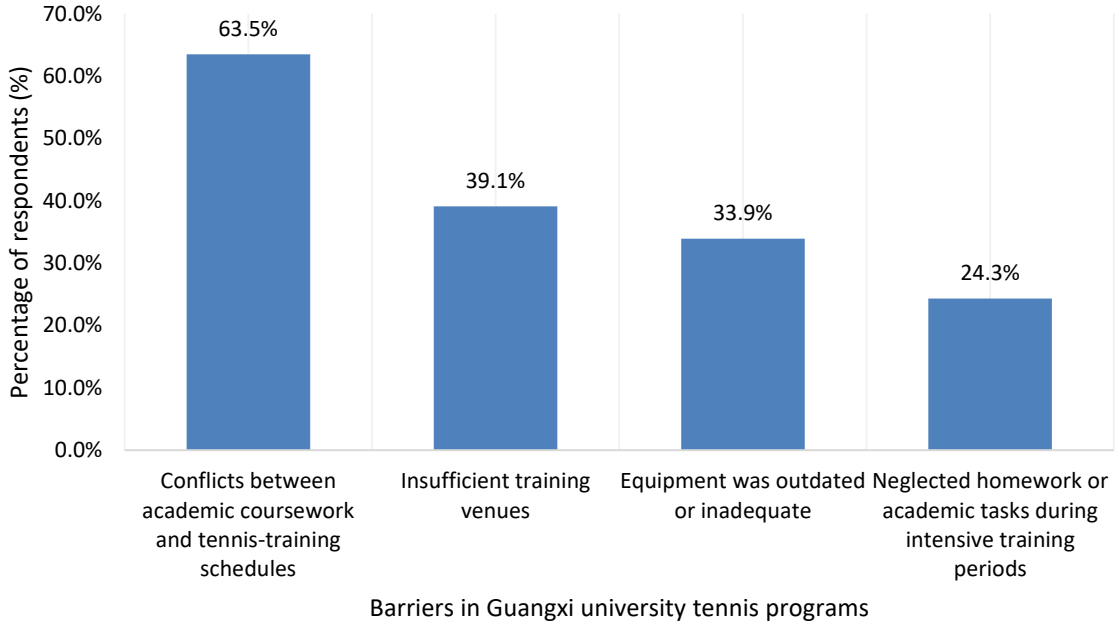

Figure 1. Key student-reported barriers in Guangxi university tennis programs.

Interview data suggest that this conflict is closely related to rigid course scheduling and insufficient interdepartmental coordination. In many universities, tennis training is arranged in afternoons, evenings, or weekends that overlap with key academic periods, while academic affairs and sports units rarely coordinate systematically. As a result, students are often forced into an “either/or” choice between study and training. The contradiction between study and training should also be understood in relation to recovery needs. Student-athletes facing dual-career stress require not only timetable coordination but also adequate sleep, recovery, and cognitive readiness. Recent evidence shows that sleep extension can improve both physical and cognitive performance in physically active university students, which supports the need for more holistic scheduling and load management in university tennis programs [6].

(3) Coaching team: professional gaps and limited development opportunities

The coaching team has basic teaching qualifications but still shows gaps in specialized and interdisciplinary support capacity. Among the eight coaches interviewed, six held master’s degrees and lecturer qualifications, but only two had experience in national-level tennis competitions, and none had participated in international coaching exchange programs. Interview and field data show coaching practice focuses largely on basic techniques, with little emphasis on advanced tactics, psychological regulation, and academic guidance. This

matters because youth sport research reveals game-based and cognitively demanding training improves problem-solving and creative thinking, showing the value of more tactical and cognitively engaging coaching methods [7].

Deep learning technology provides a new technical path for optimizing tennis training and enhancing coaching scientific. Wang et al. realized precise analysis of key sports positions through deep learning-based video analysis, supporting coaches to quantitatively evaluate students' serving, hitting and other tennis techniques [8]. Li et al. explored the cultivation of deep learning ability in blended learning, which can guide university tennis coaches to construct online-offline integrated training courses and make up for deficiencies of traditional single training methods [9].

Career development opportunities for coaches were also restricted. Of the eight coaches interviewed, 87.5% reported no regular coach-training mechanism, and only 12.5% obtained funding for seminars or exchanges. Such weak institutional support leads to relatively slow professional development. What's more, 87.5% of the coaches also mentioned inadequate funding for coaching, competitions, and equipment upgrades, which further limits development opportunities.

(4) Evaluation system: utilitarian orientation and incomplete indicators

The evaluation system for tennis talent cultivation in Guangxi universities remains highly competition oriented. Among these eight coaches, 87.5% stated that evaluation is dominated by award counts, while developmental indicators such as academic performance, tactical awareness, and psychological quality carry little weight.

From coaches' perspective, annual performance assessment was dominated by students' awards in provincial or municipal competitions. Of the eight coaches, 87.5% indicated that teaching innovation, academic guidance and contributions to students' comprehensive development were rarely emphasized.

In this study, coaching effectiveness was evaluated via questionnaires and interviews on assessment criteria, performance indicators and institutional expectations. The findings suggest that the current evaluation system encourages short-term competitive outcomes more than long-term holistic development (Figure 2).

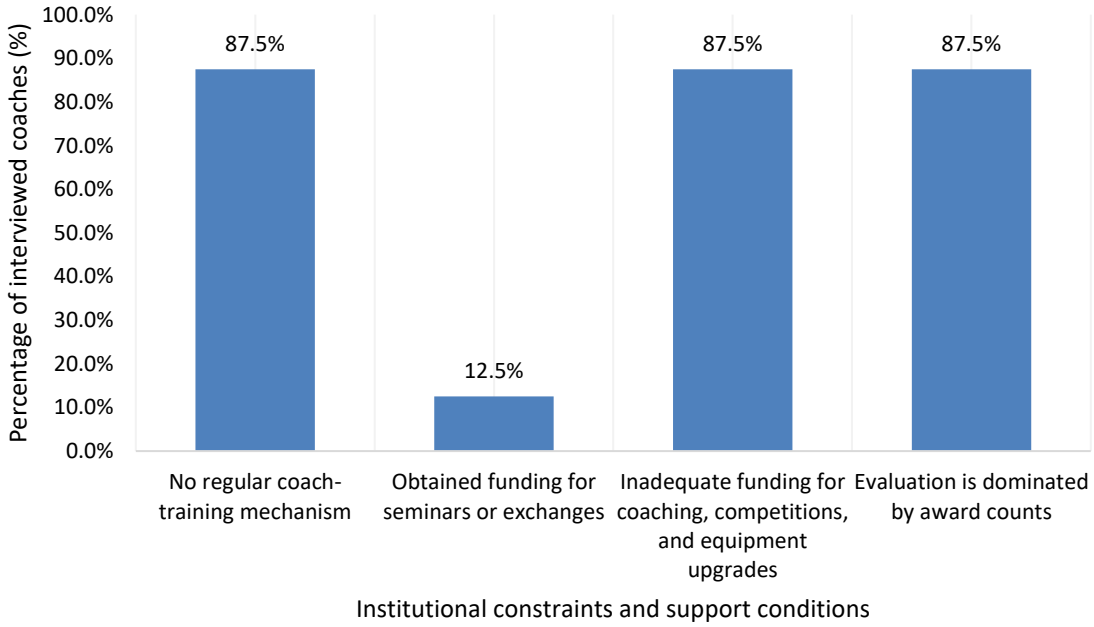

Figure 2. Coach-side institutional constraints and support conditions.

Characteristics of international models and their implications

The EU model emphasizes dual-career support, flexible academic arrangements, and cross-sectoral cooperation among schools, clubs, and public institutions. The NCAA model emphasizes standardized management, including training-time control, academic eligibility requirements, coach certification, and institutional accountability. In addition to these two reference systems, physical education and sport curricula in some Asian and European settings also show a stronger tendency toward interdisciplinary integration, flexible

credit recognition, and collaboration with external sport organizations.

For Guangxi, the key lesson is not simple transplantation but selective adaptation. International experience suggests that effective reform requires at least four local conditions: administrative coordination between academic and sports departments, minimum facility and funding support, recognition of flexible or alternative credits, and continuing professional development opportunities for coaches. Without these conditions, imported models may remain symbolic rather than operational. Table 2 provides a structured comparison of international reference models and their selective implications for Guangxi universities.

Table 2. International model comparison and implications for Guangxi.

System/Region	Core characteristics	Strengths	Transfer conditions	Implications for Guangxi
European Union dual-career model	Flexible study arrangements; cross-sector collaboration; support for athlete education	Balances academic and athletic development	Needs interdepartmental coordination and flexible credit recognition	Useful for reducing academic-training conflict and improving student support
NCAA model (United States)	Eligibility rules; training-time regulation; coach certification; institutional accountability	Strong management and clearer governance responsibilities	Needs standardized institutional rules and monitoring capacity	Useful for coach management, assessment reform, and schedule regulation
Selected Asian/European curriculum practice	Stronger interdisciplinary integration; cooperation with clubs or external sport bodies	Links technical training with sport science and career development	Needs curriculum redesign and access to external partners	Useful for embedding psychology, sport science, and career-planning elements into tennis curricula

Discussion

Underlying causes of the dilemmas in Guangxi Universities

(1) Institutional barriers: fragmented governance and weak coordination

The finding that resources are unevenly distributed and poorly integrated reflects an institutional problem rather than merely a material shortage. In the present study, students identified lack of venues and equipment as major barriers, while coaches emphasized insufficient funding and limited external cooperation. Together, these results suggest that the existing governance structure does not effectively connect university resources with local clubs, sports bureaus, or community sport organizations.

Within universities, the separation between academic affairs and sports administration further aggravates the problem. Because course schedules, training arrangements, and student support services are usually managed by different units, students often face avoidable conflicts between academic learning and athletic participation.

(2) Curriculum deficiencies: limited flexibility and weak interdisciplinary design

The high proportion of students reporting academic-training conflict indicates that the curriculum system has not yet internalized the logic of sports-education integration. The current findings support the view that many tennis programs remain narrow in technical orientation and insufficiently flexible in scheduling, rather than being organized as integrated talent-development pathways.

Interview feedback further suggests that interdisciplinary elements such as sports science, psychology, and career planning are not systematically embedded in current tennis curricula. For this reason, it is more accurate to say that the available evidence points to limited interdisciplinary integration, rather than claiming that such integration is entirely absent.

(3) Professional weaknesses: coaching development and scientific training support

The present study shows that coaching limitations are linked not only to individual capacity but also to weak institutional support. Students' dissatisfaction with single training methods and limited academic guidance, together with coaches' reports of low access to

continuing education, indicate that current coaching development remains under-supported. This issue is increasingly important because modern racket-sport training benefits from interdisciplinary knowledge.

Recent biomechanics research has shown how scientific analysis can help optimize performance, reduce injury risk, and improve rehabilitation planning [10-12]. Therefore, strengthening the connection between university coaches and sports-science research institutions is a practical way to improve the scientific basis of tennis training.

(4) Conceptual biases: utilitarian evaluation and narrow definitions of success

The evaluation findings indicate that universities and coaches are still influenced by a utilitarian logic that equates training effectiveness mainly with short-term competition results. However, the sports-education integration framework emphasizes the balanced development of athletic competence, academic literacy, psychological quality, and long-term career adaptability. When competition awards dominate evaluation, students and coaches may both prioritize immediate results over sustainable growth.

Improvement paths and their operational implications

(1) Optimizing cross-departmental resource integration

Problem addressed: unequal resource distribution and low utilization efficiency in current campus physical education practice. Evidence: 39.1% of students reported insufficient venues, 33.9% reported inadequate equipment, and most coaches reported insufficient stable operating funding in daily training.

Improvement path: establishing a cross-department coordination mechanism linking universities, local sports bureaus, clubs, and social organizations. A practical first step is to pilot joint venue use, shared coaching resources, and co-organize diversified standardized competitions in selected universities. This path is more likely to work if local government departments are willing to actively coordinate and if partner institutions have clear rational responsibility-sharing arrangements aligned with long-term goals.

(2) Constructing a collaborative academic-training curriculum system

Addressing the persistent conflict between academic study and athletic training is a key priority. Evidence highlights the severity of this issue: 63.5% of survey respondents reported experiencing scheduling conflicts, while interviewees consistently pointed to weak coordination between academic and sports departments as a root cause.

To address this, a collaborative curriculum system should be developed, featuring flexible scheduling options, reduced training loads during intensive academic periods, and selective credit recognition for training or competition participation. A practical first step is to establish a joint review mechanism, wherein academic-affairs offices and sports departments work together to approve individualized training-study arrangements for eligible students. This mechanism would ensure both academic progress and athletic development are mutually supported.

(3) Strengthening coach professional development

Problem addressed: single training methods, weak academic guidance, and limited exposure to advanced coaching concepts. Evidence: 50.4% of students were dissatisfied with training methods, 40.9% reported insufficient academic-guidance support, and 87.5% of coaches reported a lack of regular development mechanisms.

Improvement path: build a continuing professional development system that combines coach training, teaching observation, interdisciplinary workshops, and research collaboration. A practical step is to include participation in certified training, teaching innovation, and cooperation with sports-science units in annual coach assessment.

(4) Establishing a diversified comprehensive evaluation system

Problem addressed: overly competition-oriented evaluation. Evidence: 59.1% of students reported that assessment focused mainly on technical tests and competition results, and most coaches confirmed that award counts dominated performance evaluation.

Improvement path: Moving from a single-result evaluation model to a diversified system that includes academic performance, tactical understanding, psychological quality, learning engagement, and sportsmanship in addition to technical and competitive indicators. A practical first step is to revise university tennis rubrics and coach performance forms, so these broader indicators carry visible weight. Table 3 links each key problem with supporting evidence,

improvement paths, and operational implications.

Table 3. Problem-evidence-improvement path alignment.

Problem identified	Evidence from this study	Improvement path	Operational implication
Unequal resource distribution and weak external integration	39.1% reported insufficient venues; 33.9% reported inadequate equipment; most coaches reported insufficient funding	Optimize cross-departmental resource integration	Pilot shared venues, club partnerships, and co-organized competitions
Frequent academic-training conflict	63.5% reported schedule conflict; interviews described rigid timetables and weak coordination	Construct a collaborative academic-training curriculum system	Introducing individualized study-training review and flexible credit arrangements
Limited coach development and single training methods	50.4% dissatisfied with training methods; 40.9% perceived weak academic guidance; 87.5% reported no regular training mechanism	Strengthen coach professional development	Embed workshops, certified training, and sports-science collaboration into annual development plans
Overly competition-oriented evaluation	59.1% reported assessment focused on technical tests and competition results; most coaches confirmed award-count dominance	Establish a diversified comprehensive evaluation system	Revise student rubrics and coach assessment forms to include academic, tactical, and psychological indicators

Policy implications, limitations, and future research

At the policy level, the findings support a progressive strategy for incorporating tennis into broader school sport pathways. Tennis can be introduced in primary education as part of physical literacy and coordination training, expanded in secondary education through elective courses and school-club cooperation, and developed more systematically in universities through credit-linked training programs and interdisciplinary support services.

Several limitations should be acknowledged. First, the study is geographically limited to 12 universities in Guangxi, so the findings should not be generalized directly to all regions of China. Second, part of the evidence relies on self-report, which may involve recall bias or social desirability bias. Third, participant recruitment depended partly on access and availability, which may have introduced sampling bias. Fourth, field investigation was conducted on site in only 8 universities, while information from the remaining 4 institutions was collected online. This may have reduced the depth of observational comparison. Finally, because subgroup counts in the archived dataset were inconsistent, this revision reports cleaned aggregate descriptive results rather than subgroup inferential analysis.

Future studies should expand the regional scope, reconstruct a clean subgroup-level database, and use inferential statistics to compare students from different majors or training backgrounds. Longitudinal research is also needed to evaluate whether the proposed improvement paths can produce sustained gains in academic performance, training quality, and athlete development.

Conclusion

Using universities in Guangxi as the empirical setting, this study examines the current status, major dilemmas, and improvement paths of the integrated sports-education training model for Chinese youth tennis talents from an international comparative perspective. The findings indicate that the current university-based model is constrained by uneven resource allocation, frequent academic-training conflict, underdeveloped coaching support, and a utilitarian evaluation system.

Drawing on international experience while recognizing local transfer conditions, this paper proposes four context-sensitive improvement paths: Optimizing cross-departmental resource integration, constructing a collaborative academic-training curriculum system, strengthening coach professional development, and establishing a diversified comprehensive evaluation system. These paths aim to support the coordinated development of students' athletic competence, academic literacy, and long-term adaptability.

This study contributes to the theoretical discussion of sports-education integration in the field of tennis talent

cultivation and provides a practical reference for similar university-based programs in China. Because the evidence is regionally bounded and the subgroup dataset still requires verification, broader generalization should be made cautiously and tested in future multi-regional studies.

Funding

This work was not supported by any funds

Acknowledgements

The authors would like to show sincere thanks to those techniques who have contributed to this research.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Zhang, Y. (2024) The optimization of college tennis training and teaching under deep learning. *Heliyon*, 10(4), e25954.

[2] Bouzouraa, E., Dhahbi, W., Ferchichi, A., Geantă, V. A., Kunszabo, M. I., Chtourou, H., Souissi, N. (2025) Single-night sleep extension enhances morning physical and cognitive performance across time of day in physically active university students: a randomized crossover study. *Life*, 15(8), 1178.

[3] Rodriguez, A., Williams, Z. (2024) Research on the dilemma and sustainable development of youth sports. *The Young Thinker's Review*, (3), 15-21.

[4] Höner, O., Murr, D., Larkin, P., Schreiner, R., Leyhr, D. (2021) Nationwide subjective and objective assessments of potential talent predictors in elite youth soccer: an investigation of prognostic validity in a prospective study. *Frontiers in Sports and Active Living*, 3, 638227.

[5] Lin, W. (2021) Research on the integration of sports and education based on the characteristics of the times. *Training*, 4(4), 63-66.

[6] Bouzouraa, M. M., Dhahbi, W., Ghouili, H., Hamaidi, J., Aissa, M. B., Dergaa, I., Knechtle, B. (2025) Enhancing problem-solving skills and creative thinking abilities in U-13 soccer players: the impact of rondo possession games' training. *Biology of Sport*, 42(3), 227-238.

[7] Taylor, J., Ashford, M., Jefferson, M. (2023) High performance coach cognition in the wild: Using applied cognitive task analysis for practical insights - cognitive challenges and curriculum knowledge. *Frontiers in Psychology*, 14, 1154168.

[8] Wang, Z., Cheng, H., Qin, Q. (2025) The research on video analysis of key motion positions based on deep learning technology. *International Journal of e-Collaboration (IJeC)*, 21(1), 1-16.

[9] Li, Y., Cheng, H., Qin, Q. (2025) Evaluations and improvement methods of deep learning ability in blended learning. *International Journal of e-Collaboration (IJeC)*, 21(1), 1-17.

[10] Dhahbi, W. (2025) Advancing biomechanics: enhancing sports performance, mitigating injury risks, and optimizing athlete rehabilitation. *Frontiers in Sports and Active Living*, 7, 1556024.

[11] Tajik, R., Dhahbi, W., Fadaei, H., Mimar, R. (2025) Muscle synergy analysis during badminton forehand overhead smash: integrating electromyography and musculoskeletal modeling. *Frontiers in Sports and Active Living*, 7, 1596670.

[12] Zhao, F. (2024) The application of sports biomechanics in sports injury prevention and rehabilitation. *Frontiers in Sport Research*, 6(3), 142-147.