THE JOURNAL OF
INTERACTIVE SOCIAL SCIENCES
2025 Vol. 1, No. 1, ISSN 3030-5322

Research on Innovative Development Strategies for Digitalization in Enhancing University Track and Field Training

Taotao Xiong[1*]

[1]Hunan Institute of Science and Technology, Yueyang, Hunan, 414006, China
Corresponding Author*: Taotao Xiong E-mail: xiongtt2001@163.com

ARTICLE INFO

Keywords
Digitalization
University Track and Field Training
Innovative Strategies

Published
16 March 2025

ABSTRACT

The application of digital technology in university track and field training is becoming increasingly widespread, bringing new opportunities for the innovation of training models and the improvement of training effectiveness. This study aims to explore the innovative development strategies of digital empowerment in university track and field training. Through the review of relevant literature and analysis of actual cases, this study elaborates on the advantages of digital technology in track and field training. It proposes specific innovative strategies in aspects such as training plan formulation, training process monitoring, training data analysis, and training resource integration, to provide references for the scientific and efficient development of university track and field training.

1. Introduction

With the rapid development of information technology, digital technology has been widely applied in various fields, including university sports education. Track and field, as an important part of university sports, the traditional training model has gradually shown its limitations when facing the diverse needs of students in the new era and the high-level competitive requirements (Jing et al., 2024). The application of digital technology has brought new ideas and methods to university track and field training, which can effectively enhance the scientific, accuracy, and individualization level of training, and promote the development of university track and field training towards an innovative direction. In-depth research on the creative strategies of digital empowerment of university track and field training has important practical significance for improving the quality of university track and field education and cultivating outstanding track and field talents.

Citation: Xiong, T. (2025). Research on Innovative Development Strategies for Digitalization in Enhancing University Track and Field Training. *The Journal of Interactive Social Science*, 1(1), 10-16.

3030-5322/© The Authors. Published by J&L Academic Group PLT. This is an open access article under the CC BY 4.0 license.
https://doi.org/10.64744/tjiss.2025.7

2. The advantages of digital technology in university track and field training

2.1 Enhancing the scientific nature of training plans

Traditional track and field training plans are often formulated based on coaches' experience and find it difficult to fully consider the individual differences of each student. Digital technology can collect students' physical indicator data, such as heart rate, maximum oxygen uptake, muscle strength, etc., and use data analysis models to tailor personalized training plans for each student. For example, with the help of smart wearable devices, students' physiological data during daily activities and training can be obtained in real time. Coaches can assess the students' physical condition based on the data and adjust the training intensity and content reasonably, making the training plan more in line with the students' actual situation and improving the training effect (De Fazio et a., 2023).

Figure 1. Comparison between traditional training and digital-enabled training

2.2 Achieving precise monitoring of the training process

During the track and field training process, real-time monitoring of students' technical movements and training status is of vital importance. Digital technology offers various monitoring methods, such as high-speed cameras and motion capture systems. During the track and field training process, real-time monitoring of students' technical movements and training status is of vital importance. High-speed cameras can capture students' training movements at a high frame rate. Digital technology offers various monitoring methods, such as high-speed cameras and motion capture systems. High-speed cameras can capture students' training movements at a high frame rate. Coaches can review the slow-motion footage to clearly observe the details of students' technical movements, promptly identify deviations in the movements, and make corrections. The motion capture system can precisely record the movement trajectories of each part of the student's body. Coaches can review the slow-motion footage to clearly observe the details of students' technical movements, promptly identify deviations in the movements, and make corrections. By comparing the collected data with the standard movement model, it can quantitatively analyze the quality of students' movements and provide precise guidance for technical improvement. The motion capture system can precisely record the movement trajectories of each part of the student's body. By comparing the collected data with the standard movement model, it can quantitatively analyze the quality of students' movements and provide precise guidance for technical improvement.

2.3 Deeply explore the value of training data

Digital technology has made it possible to collect and store a large amount of training data. Through in-depth analysis of the data, much valuable information can be unearthed. On one hand, coaches can understand the progress trend and development bottlenecks of students by analyzing their long-term training data, thereby adjusting the training strategies and helping students break through the bottlenecks and achieve improvement in their performance. For example, by analyzing data such as the starting reaction time of sprinters, the step frequency and stride length changes during acceleration, the key factors affecting their starting and acceleration performance can be identified, and targeted specialized training can be carried out. On the other hand, by comparing the data of different students, coaches can discover the strengths and weaknesses of students, carry out differentiated teaching, and promote mutual learning and common progress among students (Deng 2025).

2.4 Optimize the integration and utilization of training resources

University track and field training involves various resources, including venues, training equipment, teaching materials, etc. Digital technology helps to achieve the optimization, integration, and efficient utilization of these resources. By building a digital training resource management platform, schools can monitor the usage of venues in real time, arrange training time reasonably, and improve the utilization rate of venues (Qin & Wu 2021). At the same time, the platform can integrate information on various training equipment, including the quantity, performance, maintenance records, etc., to facilitate coaches to promptly allocate equipment according to training needs. In terms of teaching materials, the digital resource library can store rich materials such as track and field training videos, teaching presentations, academic papers, etc., allowing students and coaches to access these resources anytime and anywhere through the network, providing convenience for teaching and training.

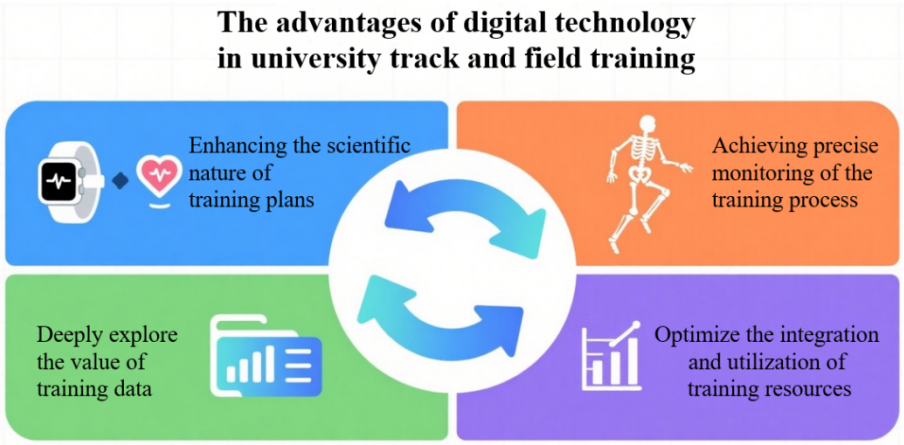

Figure 2. The advantages of digital technology in university track and field training

3. Digitalization Empowering Innovative Strategies for University Track and Field Training

3.1 Personalized Training Plan Development Based on Big Data Analysis

3.1.1 Data Collection and Organization

Colleges and universities should establish a complete data collection system for track and field training, comprehensively using various means such as smart wearable devices, motion sensors, and campus management systems to widely collect students' basic physical information (such as height, weight, age, etc.), physical fitness data (such as strength, speed, endurance,

flexibility, etc.), sports performance data (training results, competition results, etc.) and learning and living habits data (sleep schedule, diet, etc.). Clean and organize the collected data, removing outliers and duplicate data to ensure the accuracy and completeness of the data. Store the organized data in a dedicated database to provide a basis for subsequent data analysis and training plan formulation.

3.1.2 Data Analysis and Model Construction

Using big data analysis technology, conduct an in-depth analysis of students' various data. Through clustering analysis, correlation analysis, etc., identify the key factors affecting the effectiveness of students' track and field training and establish personalized training plan models. For example, for the sprint event, analyze factors such as starting reaction time, acceleration ability, running technique during the middle distance, and endurance during the sprint stage, and their relationships with final results, and build a model that can predict the potential for students' performance improvement. Based on the analysis results, combined with the basic principles and goals of track and field training, formulate detailed training plans for each student, including training content, training intensity, training frequency, and rest and recovery arrangements.

3.1.3 Plan Adjustment and Optimization

The training plan is not fixed but needs to be dynamically adjusted according to the progress of students' training and actual circumstances. Coaches should regularly collect real-time data from students during training and compare it with the expected goals in the training plan. If there is a deviation between the actual performance and the expected results, promptly identify the reasons, such as excessive training intensity causing fatigue and injury, or improper training methods affecting the improvement of technical movements. Based on the analysis results, make corresponding adjustments to the training plan, optimize training content and training parameters, and ensure that the training plan always meets the needs of students and maximally promotes the improvement of training effectiveness.

3.2 Real-time Monitoring and Feedback through Smart Devices in the Training Process

3.2.1 Selection and Application of Smart Devices

Colleges and universities should equip track and field training with diverse smart devices to meet the monitoring needs of different training stages. In terms of motion performance monitoring, high-precision motion sensors such as accelerometers and gyroscopes can be installed on students' sports equipment or key body parts to collect real-time data on speed, acceleration, angle, etc., during running, jumping, throwing, etc., accurately assessing students' motion performance (Xiong & Li 2025). In terms of physiological state monitoring, smart wristbands, heart rate belts, etc., can be selected to monitor students' heart rate, blood pressure, blood oxygen saturation, etc., of physiological indicators, helping coaches understand students' exercise intensity and fatigue level, and avoiding excessive training.

3.2.2 Construction of Real-time Data Transmission and Feedback System

Establish a real-time data transmission network to promptly transmit data collected by smart devices to the data analysis platform on the coach's end through Bluetooth, Wi-Fi, etc. The platform has real-time data processing and visualization display functions, capable of presenting students' training data in graphical, curve, etc., intuitive forms, allowing coaches to understand students' training status in a timely manner. At the same time, develop a training feedback system. When students' training data shows abnormalities, the system automatically sends warning

information to the coach and the student. Coaches, based on the feedback information, promptly communicate with students, adjust training strategies, provide on-site guidance, and help students correct incorrect movements, optimizing the training process (Cai et al., 2025).

3.2.3 Training Device Usage Training and Maintenance

To ensure the effective application of smart devices in track and field training, colleges and universities should organize training for coaches and students. The training content includes the usage methods of intelligent devices, data interpretation, handling of common problems, etc., enabling coaches and students to master the operation skills of the devices and fully utilize their functions. At the same time, an intelligent device maintenance management system is established, with dedicated personnel responsible for the daily maintenance and regular inspections of the devices, and timely updates of the software versions to ensure the normal operation of the devices.

3.3 Utilizing the data platform for in-depth analysis of training data

3.3.1 Construction of a professional data analysis platform

Colleges and universities should invest funds and technical resources to build a platform specifically for the analysis of track and field training data. This platform should have strong data storage and processing capabilities, be able to integrate training data from different intelligent devices and data sources, and conduct efficient data analysis operations. The platform should provide rich data analysis tools and algorithm libraries, support advanced analysis techniques such as data mining and machine learning, and meet the needs of coaches and researchers for in-depth analysis of training data. At the same time, the platform should have a good user interface design, be easy to operate, and be convenient for coaches and students to use.

3.3.2 Multi-dimensional data analysis and visualization display

Using the data analysis platform, conduct a multi-dimensional analysis of track and field training data. From the time dimension, analyze the changes in students' scores and physical development in different training stages, helping coaches understand the training effect of students over time and promptly identify training problems and adjust training plans. From the project dimension, for different track and field events, analyze the key technical indicators and physical elements involved in each event, providing a scientific basis for specialized training of the events. From the individual and group dimensions, both conduct in-depth analysis of individual data for each student and formulate personalized training plans, and conduct comprehensive analysis of the data of the entire track and field training team to identify the team's overall strengths and weaknesses, and carry out targeted team training and collective guidance. Through data visualization technology, present the analysis results in intuitive, vivid charts, graphs, animations, etc., such as score change curves, technical action comparison diagrams, physical index radar charts, etc., enabling coaches and students to understand the training situation reflected by the data more clearly, and facilitate decision-making and adjustments.

3.3.3 Data-driven training decision-making and scientific research innovation

Deeply apply the analysis results to track and field training decisions. Based on the information provided by the data analysis platform, such as students' physical fitness weaknesses, technical weak links, and the rationality of training load, coaches can adjust training content, methods, and intensity in a timely manner, achieving scientific training decision-making. For example, if the analysis shows that a student lacks endurance in middle and long-distance running training, the coach can increase targeted endurance training projects, adjust training intensity, and

interval time. At the same time, encourage researchers to conduct related scientific research based on training data analysis, exploring new laws and methods of track and field training.

3.4 Construction of a Digital Training Resource Sharing Platform

3.4.1 Platform Architecture Design and Function Module Development

Design and construct the overall architecture of the digital training resource sharing platform for university athletics, ensuring that the platform has good stability, scalability, and compatibility. In future development, universities should further increase investment and support in the application of digital technology in athletics training, continuously explore and improve innovative models of digital empowerment of athletics training to adapt to the needs of new era sports education development, and promote the advancement of university athletics to new heights (Zhang 2023).

3.4.2 Collection, Organization, and Upload of Training Resources

A dedicated team is organized to collect and organize the training resources for track and field. On one hand, various existing training resources within the school are widely collected, including teaching materials and training videos created by the school's coaches and teachers, as well as literature materials related to track and field training in the school library and archives. After screening, organizing, and digitizing these resources, they are uploaded to the platform for unified management. On the other hand, active cooperation is established with other universities, sports research institutions, and professional sports websites to obtain high-quality training resources from outside, and these resources are integrated and uploaded in accordance with the platform's standards. At the same time, coaches, students, and researchers are encouraged to independently create and share training resources, such as writing training reflections and creating personalized training plan cases, to enrich the content of the platform's resource library.

3.4.3 Platform Promotion and Application Incentive Mechanism Establishment

To increase the usage rate and influence of the digital training resource sharing platform and strengthen its promotion efforts, the platform's promotion work is strengthened. Through internal publicity channels, such as the campus network, bulletin boards, and physical sports courses, the platform's functions and advantages are introduced to teachers and students, guiding them to actively use the platform. A platform application incentive mechanism is established, rewarding users who actively share high-quality resources, participate in communication and interaction, and provide valuable suggestions with certain rewards, such as honorary certificates, point exchanges, priority participation in training and research projects, etc. Regular statistics and analysis of the platform's usage are conducted to understand users' needs and feedback, continuously optimizing the platform's functions and resource content, improving user experience, promoting the platform's continuous development and effective application, and achieving the efficient integration and extensive exchange of university track and field training resources.

4 Conclusion

Digital technology has brought many advantages to university track and field training, comprehensively promoting the innovation of university track and field training models in terms of the scientific of training plans, the accuracy of training process monitoring, the depth of training data analysis, and the efficiency of training resource integration. Through the implementation of personalized training plan formulation based on big data analysis, real-time monitoring and feedback of training processes through intelligent devices, the improvement of

training data depth analysis and application capabilities through data analysis platforms, and the construction of a digital training resource sharing platform to promote resource integration and communication, innovative strategies such as personalized training plan formulation based on big data analysis, real-time monitoring and feedback of training processes through intelligent devices, improvement of training data depth analysis and application capabilities through data analysis platforms, and construction of a digital training resource sharing platform to promote resource integration and communication can effectively enhance the quality and effectiveness of university track and field training, cultivating more track and field talents with high-level athletic abilities and comprehensive qualities. In the future, universities should further increase investment and support in the application of digital technology in track and field training, continuously explore and improve innovative models of digital empowerment of track and field training, to adapt to the needs of new era sports education development, and promote the university track and field cause to a new height.

Acknowledgments

We are grateful to all respondents who participated in this study.

Funding

2024 Annual Hunan Provincial Social Science Fund Project "Research on the Application of Artificial Intelligence in School Sports and the Comprehensive Development of Teenagers" (Number: 24YBA311).

References

[1]. Cai, X., Xian, Y., Liu, T., Zhou, Y., Chen, Q., & Cui, H. (2025). A study on factors influencing digital sports participation among Chinese secondary school students based on explainable machine learning. *Scientific Reports, 15*(1), 15657.

[2]. De Fazio, R., Mastronardi, V. M., De Vittorio, M., & Visconti, P. (2023). Wearable sensors and smart devices to monitor rehabilitation parameters and sports performance: An overview. *Sensors, 23*(4), 1856.

[3]. Deng, C. (2025). Motion analysis and training optimization for track and field athletes based on machine vision. *Journal of Computational Methods in Sciences and Engineering, 25*(1), 370–380.

[4]. Jing, R., Wang, Z., & Suo, P. (2024). Optimization of track and field training methods based on SSA-BP and its effect on athletes' explosive power. *Heliyon, 10*(3), e25465.

[5]. Qin, Y., & Wu, W. (2021). Optimized allocation of resources for intelligent construction of training venues for track and field teams. *Mobile Information Systems, 2021,* 1–11.

[6]. Xiong, T., & Li, J. (2025). The historical evolution path, characteristics, and development trends of digital sports in China. *International Educational Research Development, 2*(1), 1–3.

[7]. Zhang, Y. (2023). Track and field training state analysis based on an acceleration sensor and deep learning. *Evolutionary Intelligence, 16*(5), 1627–1636.