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Use of Artificial Intelligence for Talent Identification and Acquisition in Physical Education:

A Structured Framework for Athletics at District, State, and National Levels

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Abstract

Talent identification and acquisition in physical education, particularly in athletics, has traditionally relied on subjective assessment methods, coach observation, and standardized fitness testing. While these methods have produced successful athletes, they often lack scalability, objectivity, and data-driven precision. The rapid advancement of Artificial Intelligence (AI), machine learning, wearable technologies, and performance analytics offers transformative opportunities for modernizing talent identification systems.

This research paper explores the use of AI in identifying and acquiring athletic talent within the physical education ecosystem, with a structured focus on district, state, and national levels. The study proposes an integrated AI-based framework combining anthropometric profiling, performance analytics, biomechanical analysis, physiological markers, and predictive modeling.

At the district level, AI assists in mass screening through mobile applications and wearable data collection. At the state level, predictive algorithms track longitudinal development and injury risks. At the national level, centralized databases and advanced analytics support elite pathway development and performance forecasting.

The paper discusses ethical considerations, data governance, inclusivity, cost implications, and implementation challenges within the Indian sports context. The findings suggest that AI-driven systems enhance transparency, reduce bias, improve early detection accuracy, and support evidence-based talent acquisition strategies in athletics.

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1. Introduction

Talent identification (TID) is a systematic process of recognizing individuals with the potential to excel in specific sports. In athletics, early identification is crucial because speed, endurance, coordination, and physiological capacity often develop during formative years.

Traditionally, TID in physical education has relied on sprint tests, standing broad jump, beep test, anthropometric measurements, and coach observation. However, these methods are subjective, limited to short-term performance, influenced by environmental factors, and lacking predictive accuracy.

Artificial Intelligence provides an opportunity to move from observational selection to predictive, data-driven talent acquisition systems.

2. Review of Literature

Global sports systems increasingly integrate AI in athlete monitoring and scouting. Machine learning models have demonstrated predictive accuracy in forecasting sprint potential using anthropometric and neuromuscular variables. Wearable-based data collection improves longitudinal tracking, and computer vision systems analyze biomechanics for performance correction.

Countries such as the United States, China, and Australia have adopted centralized athlete data ecosystems for elite talent development. In the Indian context, talent identification remains decentralized and inconsistent across districts and states, presenting significant research opportunities for AI integration.

3. Objectives of the Study

- To examine the role of AI in talent identification in physical education.
- To develop a multi-level AI framework for athletics (district, state, national).
- To evaluate the benefits and limitations of AI-based talent acquisition systems.
- To propose an implementation model suitable for Indian sports structures.

4. Conceptual Framework: AI in Talent Identification

Artificial Intelligence in sports involves Machine Learning, Deep Learning, Computer Vision, Predictive Analytics, and Data Mining.

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Core Components include: Data Collection Layer – Wearables, motion capture, fitness testing apps. Data Processing Layer – AI algorithms, predictive modeling, biomechanical analysis. Decision Support Layer – Talent ranking, injury prediction, performance forecasting.

5. AI-Based Talent Identification Model for Athletics

A. District Level Talent Identification – Focus on mass screening using AI-enabled timing gates, motion capture, anthropometric profiling, and endurance apps. Output: District talent pool database.

B. State Level Talent Identification – Longitudinal monitoring, injury prediction, event suitability modeling. Output: State-level performance dashboard.

C. National Level Talent Identification – Centralized database integration, medal probability modeling, international benchmarking. Output: National elite talent registry.

6. Methodology

Research Design: Descriptive and analytical research design.

Data Sources: Secondary literature, case studies, and conceptual modeling. Tools: AI predictive frameworks, statistical modeling, and comparative analytics.

7. Benefits of AI in Talent Identification

- Objectivity
- Scalability
- Long-term athlete tracking
- Reduced human bias
- Injury prevention
- Better resource allocation
- Transparency in selection

8. Challenges and Ethical Considerations

- Data privacy concerns
- Algorithmic bias

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- High infrastructure cost
- Digital divide
- Over-reliance on data
- Consent and child data protection

9. Proposed Implementation Model for India

Phase 1: Pilot at District Level – Government school integration and AI-based testing apps.

Phase 2: State-Level Integration – Data consolidation and coach training workshops.

Phase 3: National Centralization – Unified athlete portal and AI performance analytics center.

10. Discussion

AI enhances coach decision-making and modernizes talent identification systems. Structured AI implementation can reduce regional disparities and create equal opportunity pathways in Indian athletics.

11. Conclusion

Artificial Intelligence offers a transformative shift in talent identification and acquisition within physical education. A structured district-to-national AI framework supports early detection, systematic development, and elite athlete acquisition. Future research should involve pilot testing within Indian athletics programs to validate predictive accuracy and feasibility.

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