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AI Empowers School Physical Education: Development Opportunities, Practical Challenges, and Coping Strategie

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Abstract

With the rapid advancement of artificial intelligence technology, its application in the field of education has significantly promoted educational development. As a crucial component of the education system, physical education must also keep pace with the times to meet the demands of social progress by actively adopting and leveraging AI technologies. Through the use of literature review and logical analysis, this study aims to conduct an in-depth analysis of the developmental opportunities and challenges that AI technology brings to physical education and training, including immature technological applications, potential data quality issues, the transformation of teachers' roles and educational objectives under the trend of intelligentization, as well as personal data security risks and ethical concerns. On this basis, practical implementation strategies are proposed to provide reference and guidance for the future development of physical education.

Keywords: artificial intelligence, real-world challenges, coping strategies

1. Introduction

With the rise of artificial intelligence, transformations in technology, productivity, and education are undergoing unprecedented changes. Marked by the widespread use of software such as DeepSeek and Doubao, the integration of technology and sports has deepened significantly. Artificial intelligence not only demonstrates immense potential in professional sports but is also gradually permeating physical education and public sports life, becoming a powerful driving force for the development of school sports and national fitness initiatives. In April 2018, the Ministry of Education issued the "Higher Education Artificial Intelligence Innovation Action Plan" and the "Education Informatization 2.0 Action Plan," explicitly setting goals to accelerate the deep integration and innovative development of AI and education. These plans emphasized the importance of developing intelligent education to actively address the opportunities and challenges brought by the new wave of technology[1][2]. The Third Plenary Session of the 20th Central Committee further stressed that forging new paths for educational development and shaping new advantages in education are crucial to providing solid policy support and guidance for the digitalization and intelligence of national education, which is key to building a "digitally intelligent education" with Chinese characteristics. In recent years, the application of AI across various fields has continued to gain momentum, including in sports. Many studies have shown that the application of artificial intelligence plays a significant role in promoting the development of physical education. Its applications are extensive, ranging from data analysis to VR technology. By leveraging AI technology, the scientific and efficient aspects of physical education can be enhanced while focusing on cultivating students' comprehensive abilities and qualities.

2. The Development Opportunities of AI Empowering School Sports

2.1 Policy Guidance: Enhancing Policy Support for School Sports

The support of national policies and funding has provided fertile ground for the development of artificial intelligence, laying a solid foundation for its survival and advancement in the field of physical education, and significantly promoting the deep integration of AI with physical education. By reviewing relevant policy documents, it is evident that the government has successively introduced a series of policies actively advocating and strongly supporting the application of AI technology in school education, aiming to achieve the goal of integrating AI with education. For example, documents such as the *Action Plan for AI Innovation in Higher Education Institutions*, the *Outline for Building a Leading Sports Nation*, and the *Implementation Plan for Accelerating the Modernization of Education (2018-2022)* explicitly propose promoting the deep integration of AI with physical education, accelerating the intelligent transformation of physical education, and supporting its high-quality development. Additionally, the *New Generation Industrial AI Development Plan* issued by the

State Council in 2017 emphasizes "establishing a funding support mechanism guided by fiscal policies and driven by the market"[3]. This mechanism provides fundamental guarantees for advancing intelligent physical education toward high-quality development and the application of AI in sports. Finally, the successive introduction and implementation of these policy documents highlight the pivotal role and urgency of AI in empowering high-quality development in physical education, fully demonstrating the impact of national policies and financial support. These documents not only outline a clear direction for the deep integration of AI with physical education but also provide strong momentum for its application in the field, greatly facilitating the popularization and adoption of AI technology.

2.2 Technical and Tactical Driving Force: Enhancing Sports Skills and Tactical Analysis

In the field of competitive sports, especially in the realm of precision training, the application of artificial intelligence (AI) technology is particularly significant. Precision training is an efficient method that combines digital technology with practical experience, focusing on achieving precise control over the training process. With the help of advanced motion capture technology and AI algorithms, detailed analysis of students' or athletes' movements can be conducted to identify flaws and provide targeted improvement suggestions, ultimately leading to success in sports. For example, in gymnastics training, AI systems can accurately analyze every detail of an athlete's movements, detect and correct subtle deviations, thereby enhancing both the standardization and aesthetics of the movements and ultimately elevating competition performance. This new training model, which integrates technology and practice, promotes the shift toward digitalization and intelligence[4]. On one hand, the non-invasive functional monitoring system developed under China's "Science and Technology Winter Olympics" initiative, specifically the "Key Technologies for Physical Training and Monitoring in Winter Sports" project, can automatically generate initial functional monitoring and evaluation reports within five minutes. This system has been applied in national team events such as skeleton and parallel giant slalom snowboarding, enabling autonomous data collection, processing, and analysis for athletes[5].

2.3 Era Development: AI Drives the Evolution of Sports

In recent years, AI technology has experienced explosive growth across various fields, emerging as a rapidly rising hotspot in research[6]. This technology has achieved widespread application in numerous areas, such as production, daily life, healthcare, and financial services, significantly improving work efficiency and output levels. For instance, AI can efficiently process vast amounts of data to create precise user profiles; through machine learning, it enables intelligent machine operations, completing tasks with high accuracy and identifying and extracting features from images, speech, natural language, and other multidimensional data. In the medical field, AI can also assist doctors in diagnosis, making healthcare services more efficient and precise. These applications demonstrate that AI technology has gained broad recognition and utilization across industries. Consequently, the rapid development of AI has triggered profound and transformative effects. As technology continues to innovate, AI is expected to drive global technological progress and innovation, finding even broader applications in more fields. At the same time, AI also presents new opportunities for promoting the transformation of physical education, deepening the integration of AI and sports education, and fostering high-quality development in sports education.

3. The Realistic Challenges of AI Empowering School Sports

3.1 Immature Technology Application, Concerns Over Data Quality

The development of artificial intelligence in sports teaching and training faces numerous challenges, one of which is the immaturity of technological applications. Although AI technology holds immense potential, its current application in sports education—particularly in data collection and processing—remains imperfect. AI technology relies heavily on large datasets, yet in the field of sports education, where data quality is crucial, the available data is often fragmented and non-standardized. Data collection in sports teaching and training depends on sensors and smart devices, but environmental factors (such as magnetic interference, weather changes), limitations in device accuracy, and the complexity of athletes' movements can compromise the precision of data acquisition. For example, in outdoor track and field training, motion sensors measuring an athlete's speed and distance may be affected by wind speed, temperature, and other variables. Additionally, data collected by different types of devices may vary in format and standards, posing challenges for integration and analysis. Moreover, some equipment may generate excessive redundant or noisy data, reducing overall data quality and usability. For instance, low-quality fitness trackers may frequently produce missing or inaccurate data, hindering accurate assessments of students' training progress. Furthermore, wearable devices such as VR and AR headsets can induce dizziness, potentially creating safety risks during dynamic movements like running and jumping. Practical experience has also revealed certain hazards, such as electrical leakage in AI-powered devices, which pose additional risks to students during training sessions[7].

3.2 The Transformation of Teacher Roles and Educational Goals in the Era of Intelligent Technology

With the continuous innovation and advancement of technology, the renewal of physical education teaching and training methods has become particularly crucial. However, during the introduction and application of artificial intelligence (AI) technology, teachers and students still face numerous challenges in understanding and utilizing it. These challenges are mainly reflected in the following three aspects: First, the difficulty of transforming teachers' roles. Traditional teaching mindsets have long constrained physical education teachers, who are accustomed to conventional teaching methods. After the introduction of AI, teachers need to shift from being knowledge transmitters to becoming learning facilitators and organizers. This role transformation poses a significant challenge for many educators. Some teachers may struggle to break free from traditional teaching mindsets, remaining overly reliant on their own experience rather than leveraging AI's advantages to enhance instruction. For example, in soccer training, some teachers might prefer demonstrating tactics personally or explaining them verbally, neglecting the use of AI-powered virtual coaches for more intuitive and personalized tactical demonstrations and guidance. Consequently, scholars have pointed out that the integration of AI technology, to some extent, imposes technical pressure on teachers rather than alleviating their workload, disrupting the stable structural relationship between teachers and students. From this perspective, while AI has been introduced into sports teaching, the complexity and instability of teaching have, in certain aspects, increased. Second, the lack of technical application skills[8]. To effectively utilize various intelligent teaching tools and platforms, teachers must not only possess expertise in physical education but also acquire certain information technology and AI application skills. However, many physical education teachers currently lack proficiency in these areas, necessitating specialized training and learning. For instance, some teachers may not know how to operate smart training equipment, analyze students' sports data, or adjust teaching plans based on such data. Finally, the challenge of students adapting to new teaching models. Over-reliance on technology and the imbalance in self-directed learning: AI-mediated physical education courses can easily lead to excessive dependence on technological products and intelligent systems, undermining learners' independent study and innovative thinking. For example, students may rely too heavily on virtual coaches for guidance, lacking the motivation to think and explore independently. In gamified teaching models, students might focus solely on the entertainment value of the games while neglecting the actual mastery of sports skills.

3.3 Personal Data Security Crisis and Ethical Considerations

Sports data can be categorized into individual sports data, commercial sports data, and public sports data[9]. In the field of sports teaching and training, a significant amount of personal information about students and athletes—such as physiological indicators, movement trajectories, and training performance—is collected. This data often falls under the category of personal privacy. Without proper protective measures, such sensitive information may be illegally accessed or misused. For instance, hackers could target databases of schools or sports institutions to steal students' personal data, which not only violates their privacy rights but may also lead to severe consequences. Additionally, ethical concerns regarding data usage are increasingly prominent. Ensuring that data is used legally, fairly, and transparently has become a critical ethical issue when applying AI technologies to analyze student data. For example, questions arise over whether schools or sports institutions have the right to use students' sports data for commercial purposes and whether explicit consent from students or parents should be obtained beforehand. These issues require careful consideration and prudent handling.

4. Analysis of Measures for AI to Promote School Sports and Vocat3 Ional Training

4.1 Enhancing Intelligent Information Competence of University Faculty

Comprehensively Improving Teachers' Information Literacy The Ministry of Education's "Education Informatization 2.0 Action Plan" (2018) proposed[10]. Significant obstacles exist in practical applications[11]. With the widespread adoption of intelligent technologies in domestic physical education, the demand for smart literacy among school physical education teachers continues to rise. On one hand, it is essential to strengthen the training of physical education teachers in intelligent information technology. Schools can regularly organize professional training courses, inviting IT experts to teach topics such as foundational knowledge of artificial intelligence, the operation and application of smart sports equipment, and the use of data analysis software. Through systematic training, physical education teachers can become familiar with various intelligent technology tools and master their practical applications in teaching and training. On the other hand, practical exploration of intelligent information technology should be encouraged. Teachers should be provided with opportunities and platforms for hands-on experience, such as organizing open classes for smart physical education or teaching competitions, motivating them to experiment with AI technologies in designing teaching plans and conducting

training sessions. Through real-world practice, teachers can continuously accumulate experience, thereby enhancing their application and innovation capabilities in intelligent information technology.

4.2 Establish a Data Protection Mechanism

The importance of health and sports data for AI research is self-evident. Therefore, it is recommended that governments and sports organizations moderately open access to such data while ensuring privacy, intellectual property rights, and data security as foundational principles[12]. First, technical measures must be strengthened to enhance data security protection. Encrypting physical education teaching materials can effectively prevent theft, tampering, and other issues during storage and transmission. To ensure data confidentiality, a rigorous access control mechanism must be established. Additionally, regular security checks and vulnerability patches should be implemented to guard against hacking and malicious software intrusions. Second, a comprehensive personal data protection system must be established. This involves classifying and categorizing sports education data in universities. Education authorities and relevant institutions should strengthen supervision and management of data protection, strictly penalizing violations of data protection regulations. At the same time, data security education for physical education teachers and students should be enhanced to raise their awareness of data protection, helping them understand the importance of data security and how to safeguard their personal information. In summary, achieving secure data management and development requires collaboration across multiple domains, including technology, policy, and governance.

4.3 Rational Design of AI-Based Physical Education Teaching Plans and Curriculum Systems

In the design of physical education programs, it is essential to fully consider the characteristics and advantages of artificial intelligence, leveraging AI technology to create personalized learning plans tailored to students' individual differences and learning needs. This includes conducting comprehensive assessments of teaching objectives, methods, models, and risks, and formulating scientific teaching plans accordingly to guide rational and systematic development[13]. AI can recommend suitable sports and training intensities for each student by analyzing their physical fitness data, exercise preferences, and learning progress. Simultaneously, through AI's real-time feedback capabilities, teachers can gain immediate insights into students' learning status and physical conditions, enabling informed educational decisions to enhance teaching effectiveness. Secondly, a diversified curriculum system should be established to deeply integrate AI with physical education. Courses on AI applications in sports—such as motion data analysis, training, and competition officiating—can be introduced to familiarize students with AI's role in the field. Additionally, incorporating high-tech tools like virtual reality (VR) and augmented reality (AR) into physical education can boost students' interest and engagement by creating immersive experiences. For example, VR technology can simulate various sports scenarios, allowing students to practice and compete in virtual environments, thereby improving their athletic skills and performance levels.

5. Conclusion

In the development of physical education and training, artificial intelligence undoubtedly serves as a powerful driving force. It not only brings new opportunities for precise, intelligent, and efficient teaching and training but also presents challenges such as data security and ethical concerns. However, by maintaining an attitude of active exploration and scientific application, continuously improving relevant policies and measures, and strengthening technological research and talent development, artificial intelligence can better serve physical education and training. It is believed that in the near future, AI-powered sports education will cultivate more outstanding individuals with strong physiques and unwavering determination, contributing the unique strength of sports to societal development and progress. The application of artificial intelligence in sports is not limited to improving training efficiency and teaching quality. It can also optimize athlete performance by analyzing vast amounts of data and even predict and prevent sports injuries. Additionally, AI technology can be used in sports broadcasting and analysis to provide audiences with richer, more personalized viewing experiences. However, as AI technology becomes more deeply integrated, vigilance is required to address potential issues such as privacy breaches and misuse, ensuring the healthy development of the technology. Therefore, establishing reasonable laws and regulations, creating effective regulatory mechanisms, and cultivating professionals with both AI expertise and ethical awareness have become urgent issues in the field of physical education and training. Only in this way can we ensure that AI technology not only advances sports education and training but also safeguards the rights of athletes and users, promoting comprehensive progress in the sports industry.

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