

EMPOWERMENT OF URBAN AND RURAL SPORTS PUBLIC SERVICE EQUALIZATION BY DIGITAL NEW PRODUCTIVITY: THEORETICAL LOGIC, PRACTICAL PROBLEMS AND PRACTICAL PATH

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Abstract: To achieve the fundamental goal of national fitness, it is essential to address the imbalance and inadequacy in China's urban-rural sports public service system. Digital new-quality productivity can leverage technological integration to establish foundational support for element innovation, optimize management through paradigm building to enhance quality and efficiency, and promote ecosystem construction to facilitate the interaction among innovation chains, industrial chains, and talent chains. This drives the coordinated development of digital sports public services and rural economies, thereby continuously empowering the equalization of urban-rural sports public services. Based on practical challenges such as insufficient innovation demand-driven technological breakthroughs, management optimization bottlenecks in digital decoupling and digital divide, and model upgrading difficulties in the disintegration of two major fields and three chains, it is crucial to accurately grasp the practical pathways for digital new-quality productivity to empower the equalization of urban-rural sports public services. This requires balancing institutional incentives with governance, accelerating collaboration among industry, academia, and research in digital sports and digital rural development; addressing weaknesses while consolidating strengths and accommodating minority needs to elevate multi-dimensional digital application levels in sports public services; and establishing multi-tiered supply systems through joint contracts and model promotion. These efforts will ultimately achieve equal opportunities, equal standards, and equal outcomes in urban-rural sports public services.

Keywords: New quality productivity; Digital new quality productivity; Urban-rural; Public sports services; Equalization

1 INTRODUCTION

Against the backdrop of digital technology reshaping social production methods and public service models, digital new-quality productivity—marking a qualitative leap in productivity during the digital era—has become a key driver for equalizing basic public services between urban and rural areas [1]. With disruptive technological innovation and high-caliber talent as core drivers, it provides a new theoretical framework and practical pathways for innovative development in public services. The Third Plenary Session of the 20th Central Committee of the Communist Party of China emphasized: "In the process of comprehensive deepening reforms, we must adhere to a people-centered approach, respecting the principal status and pioneering spirit of the people," and "improve the institutional system of basic public services, strengthening inclusive, foundational, and bottom-line livelihood construction." As an essential component of social public services, urban-rural sports public services serve as both a critical lever for improving national health standards and a significant manifestation of social equity and justice. However, constrained by the urban-rural dual structure, China has long faced significant disparities in public sports services between urban and rural areas, with rural residents confronting practical challenges such as shortages of high-quality sports resources and insufficient public service supply [2]. Since the 18th National Congress of the Communist Party of China, the Party Central Committee has prioritized the development of rural sports service systems. While overall progress has been made in building basic urban-rural sports services, disparities in service quality persist, with geographical distribution showing a gradual widening gap from east to west. Enhancing sports service levels in rural areas remains the primary task for promoting equalization of urban-rural sports public services [3]. This study investigates the intrinsic relationship between digital new-quality productivity and the equalization of urban-rural sports public services from both theoretical and practical perspectives. It analyzes the practical challenges in achieving equitable sports services under the digital new-quality productivity framework, and proposes actionable implementation strategies. The research aims to provide theoretical foundations and practical references for enhancing the equalization of sports public services through digital innovation, thereby contributing to the high-quality development of China's sports public service system.

2 LITERATURE REVIEW

2.1 Digital New Productivity

Digital New Productivity, a transformative force driven by disruptive technological advancements, represents a new paradigm of productivity that serves as both an intrinsic requirement and strategic focus for high-quality economic development. As a pivotal driver of modern socio-economic systems in this new era, its core characteristics manifest

through four dimensions: First, resource paradigm shift – breaking away from traditional resource-dependent models, it positions data as the central resource while prioritizing technological innovation and intelligent management [4]. Second, integrated production elements – synthesizing knowledge, data, and technology into a synergistic framework [5]. Third, multi-stakeholder innovation – encouraging broad societal participation beyond traditional industries and research institutions [6]. Fourth, value-added efficiency – leveraging intelligence, automation, and networking to dramatically enhance resource allocation and social value creation [7]. Through disruptive technological breakthroughs, it replaces conventional tools, transforms production models, and shifts focus from material inputs to knowledge, digital assets, and technological integration, thereby boosting productivity and resource utilization while elevating product/service performance [8].

2.2 Equalization of Sports Public Services in Urban and Rural Areas

The equalization of urban and rural sports public services is a crucial component in achieving social equity and promoting coordinated urban-rural development. Since the formal proposal of the principle of public service equalization in 2005, the construction of basic public service systems has been steadily advancing. However, significant disparities in sports public services between urban and rural areas persist. On one hand, the "dualistic nature" of urban-rural development remains a major obstacle to equalization. Although China has made continuous efforts in recent years to promote equalization through policy initiatives, the separation caused by this dualistic structure—where urban and rural areas operate as two distinct social subsystems—has created implementation challenges [9]. On the other hand, substantial differences exist in sports public service facilities. According to the "National Sports Venue Statistical Survey Data" released by the General Administration of Sport of China in 2023, the total number of sports venues nationwide reached 4.5927 million, with per capita sports venue area at 2.89 square meters [10]. Despite rapid growth in both quantity and area, resource allocation remains uneven across regions and between urban and rural areas, particularly in rural regions where facility utilization and accessibility need improvement. With the maturation of digital technologies and the development of information-based platforms for sports public services, breakthroughs in overcoming spatial and temporal constraints, reducing circulation costs, and enhancing the endogenous supply capacity and efficiency of rural sports services are being achieved, thereby fostering a more equitable landscape for urban-rural sports public services [11]. In conclusion, integrating digital new-quality productivity (DNNQP) with the public sports service system is the essential pathway to accelerate the equalization of urban-rural sports public services. However, critical questions remain regarding how, where, and how to leverage DNNQP. This paper examines the core characteristics and essence of DNNQP to analyze its intrinsic logic in promoting equalization of urban-rural sports public services. By addressing the practical challenges in this field, the study provides theoretical foundations for advancing equitable sports service delivery across urban and rural areas.

3 THEORETICAL LOGIC OF DIGITAL NEW QUALITY PRODUCTIVITY EMPOWERING THE EQUALIZATION OF URBAN AND RURAL SPORTS PUBLIC SERVICES

3.1 Technology Embedding: Underlying Support and Element Innovation

The equalization of sports public services between urban and rural areas is a crucial measure to promote social equity and improve public health. However, the long-standing urban-rural dual structure has led to significant disparities in resource allocation and service quality. As a new form of productivity emerging in the digital era, digital new-quality productivity, driven by digital technology, offers new opportunities to narrow the gap in sports public services. First, comprehensive urban network infrastructure enables residents to conveniently access various sports public service resources. In rural areas, extended network coverage breaks geographical barriers, allowing rural residents to access abundant sports resources. For instance, remote villages can simultaneously watch major sports events through live streaming, experience the sports atmosphere, and ignite enthusiasm for participating in sports activities. The widespread use of smartphones and wearable devices provides diverse entry points for sports public services. Second, digital development offers convenient digital support for urban and rural residents, particularly in rural areas. Urban residents use smart bands to monitor exercise data and create personalized fitness plans. In rural areas, with the widespread use of smartphones, farmers can receive sports health knowledge notifications and sign up for online sports activities through mobile apps, narrowing the gap in access to sports public services between urban and rural residents. Sports activity data, including exercise preferences, frequency, and health status, is collected through sensors, mobile devices, and other means. For instance, smart fitness equipment installed in urban communities can automatically collect residents' usage data, while rural areas can gather relevant information through mobile apps. Integrating these scattered data points forms a comprehensive sports public service database, providing a foundation for precision services. By applying big data analytics, the collected data undergoes in-depth mining. This establishes an integrated urban-rural sports public service platform that consolidates various sports resources, including venue information, fitness instructor profiles, and sports event schedules. Thirdly, digital development enhances the accessibility of rural sports public services. Urban residents can book nearby venues through the platform, while rural residents can search for locally suitable sports activities, achieving unified resource allocation and sharing. Digital technology breaks geographical barriers to establish cross-regional sports public service collaboration platforms. High-quality urban sports resources, such as professional coaching teams and advanced fitness concepts, can be extended to rural areas via the platform. Rural-specific sports activities are precisely allocated through data analysis. For rural areas with limited sports facilities, increased investment in smart fitness equipment and small-

scale sports venues is recommended. Sports venue types should be rationally distributed based on regional needs—such as building convenient fitness centers near commercial districts for office workers and adding family-oriented sports facilities in communities to improve resource efficiency. In terms of cultural resources, folk sports activities can also be promoted to cities through the platform, fostering urban-rural sports cultural exchange and integration. Digital technology enables virtual sharing of sports resources. Urban and rural residents can access free resources such as online sports courses, e-books, and sports videos. High-quality courses produced by professional urban sports training institutions are distributed to rural areas through digital platforms, enabling rural residents to benefit from quality sports education and bridging the gap in physical resources between urban and rural areas. Social organizations can utilize online platforms to organize volunteer activities, providing free fitness guidance to urban and rural residents. For instance, some fitness companies offer affordable fitness packages tailored for rural markets, while social organizations recruit urban fitness enthusiasts to conduct sports teaching activities in rural areas through digital channels. These platforms also facilitate interaction between urban and rural residents in sports public services, organize joint participation in online sports competitions like virtual marathons, enhance community engagement, and foster a positive atmosphere for public participation in sports services.

3.2 System Restructuring: Optimizing Management to Promote Innovation and Enhance Efficiency

Digital new-quality productivity establishes a new management paradigm based on data information flow, optimizing four key management aspects of sports public service supply: process reengineering, decision-making upgrades, efficiency monitoring, and model innovation. This enhances overall service efficiency, strengthens rural sports service capabilities, and promotes equal access and quality parity in sports services between urban and rural areas. First, process reengineering and resource integration through digital technologies. Leveraging big data, cloud computing, and IoT, the entire process of sports public service applications, approvals, implementation, and feedback is digitally transformed. This breaks down departmental barriers and information silos in traditional service workflows, enabling seamless integration and efficient data circulation. For instance, the Tianxingjian Network (Tianxingjian), a national fitness information service platform developed by China's General Administration of Sport, integrates sports data and resources to eliminate barriers between entities and departments. Through cross-industry, cross-departmental, and cross-temporal resource integration, it optimizes allocation and maximizes utilization of sports resources, significantly improving public service efficiency [12]. Additionally, digital twin technology creates virtual models of sports facilities and personnel, enabling dynamic resource integration. Hangzhou's digital twin platform, for example, provides clear visibility into resource usage and maintenance across regions, achieving efficient consolidation of public sports resources. Second, data-driven decision-making upgrades powered by digital technologies. On one hand, data collection technologies are utilized to extensively gather multi-dimensional data on sports consumption behaviors, exercise preferences, and fitness frequency among urban and rural residents. Through data mining and analytical algorithms, these data are deeply analyzed to uncover latent sports demands. For instance, the smart fitness track in Ganjiang Citizens' Park is equipped with advanced intelligent systems including smart screens, lighting systems, and facial recognition. Three data collection points monitor participants' exercise status in real time, automatically displaying metrics such as step counts, speed, and calories burned on the track's large screen, enabling residents to promptly access their fitness data. On the other hand, data analysis results provide scientific basis for planning and decision-making in sports public services. Government departments can formulate more targeted sports policies, rationally allocate sports service budgets, optimize sports facility layouts, and precisely allocate sports service resources, thereby enhancing the scientific rigor and accuracy of public service decisions. Thirdly, digital technology enables efficiency monitoring and closed-loop optimization. Sensor technology and real-time monitoring systems are employed to continuously track the operational status of sports public services, collecting various data during service processes. Through data analysis, potential issues and shortcomings are identified promptly. Based on monitoring results, a closed-loop optimization mechanism is established. Identified problems are addressed by adjusting service strategies and measures, optimizing service processes and resource allocation, while continuously tracking optimization effects. This forms a virtuous cycle of monitoring-analyzing-optimizing-remonitoring, continuously improving the quality of sports public services in urban and rural areas. For instance, Changsha's "National Fitness Map" has mapped over 2,000 sports venues, using data analytics to identify underutilized sports resources. By establishing a three-tiered sports facility network linking provincial, municipal, and district levels, the system enables precise resource allocation, significantly enhancing the scientific rigor of public services and optimizing the distribution of fitness infrastructure [13]. Fourth, digital technology drives collaborative governance and model innovation. On one hand, a digital collaborative governance platform breaks down communication barriers among government, social organizations, and businesses, fostering deeper information sharing and cooperation in urban-rural sports public services. On the other hand, digital innovations transform service models, offering integrated online-offline sports events and smart fitness guidance to meet residents' diverse sports needs.

3.3 Ecological Construction: Triple Chain Interaction and Synergistic Development

In the deepening process of urban-rural development integration, the gradual realization of equal access to basic public services has become a core strategic choice for achieving rural revitalization goals, shaping a fair development environment, and consolidating the foundation of a harmonious society [11]. This decision is not isolated but deeply embedded in the grand narrative of urban-rural development, serving as a key measure to resolve the urban-rural dual

structure and promote balanced social development. With the rapid iteration of digital technologies, the rise of new digital productivity has become increasingly prominent, emerging as a critical factor in reshaping socio-economic structures. Under this context, innovation chains, industrial chains, and service chains are no longer isolated but interwoven in unprecedented ways, forming a synergistic virtuous cycle that collectively constructs a high-quality ecosystem for equal access to sports public services in urban and rural areas. First, innovation chains inject vitality into industrial and service chains, becoming the driving force behind urban-rural equality in sports public services. By leveraging digital technologies such as big data and artificial intelligence, innovation chains accurately analyze the differentiated needs of urban and rural residents for sports public services and promptly relay these needs to industrial chains, prompting enterprises to develop sports products and services tailored to different urban-rural scenarios. For example, portable and easy-to-install fitness facilities are developed to meet the demand for outdoor sports venues in rural areas, while immersive virtual reality event experience products are created to cater to urban residents' needs for sports event viewing. The outcomes of the innovation chain not only enrich the product offerings of the industrial chain but also diversify service content for the service chain, enabling urban and rural residents to access sports public services tailored to their needs. Secondly, the industrial chain serves as a bridge for implementing innovation achievements and supports the efficient operation of the service chain. Empowered by digital new productivity, the industrial chain transforms innovative results into tangible products and services, achieving rational resource allocation between urban and rural areas through digitalized production, distribution, and operations. On one hand, digitalized production enhances the efficiency and quality of sports facility manufacturing, reducing costs to ensure high-quality sports equipment and venues are available at reasonable prices across regions. On the other hand, emerging business models like e-commerce platforms and digital logistics break geographical barriers, allowing urban and rural areas to conveniently purchase sports equipment through online platforms, effectively expanding the supply scope. The smooth operation of the industrial chain ensures equitable access to sports public services in both urban and rural areas. Finally, as the terminal link in achieving sports public service equity, the service chain directly serves urban and rural residents, representing the "last mile" of service equalization. Digital new productivity empowers the service chain to adopt intelligent and personalized service concepts, driving innovative upgrades in service models. For instance, smart service platforms utilize big data and cloud computing technologies to accurately identify and analyze sports needs of urban and rural residents, providing customized public service solutions. Whether it's fitness guidance, event organization, or venue reservations, these platforms can intelligently match users' needs with tailored services. On the other hand, the personalized service philosophy centers on urban and rural residents, prioritizing user experience and feedback. Through online and offline interactions, it enables timely understanding of user satisfaction and improvement suggestions, continuously optimizing service processes and content. This not only enhances the quality and efficiency of sports public services but also promotes the equalization of sports public services between urban and rural areas.

4 THE REALISTIC PROBLEMS OF EMPOWERING THE EQUALIZATION OF URBAN AND RURAL SPORTS PUBLIC SERVICES BY DIGITAL NEW QUALITY PRODUCTIVITY

4.1 Breakthrough of Technical Bottlenecks: Insufficient Driving Force of Innovation Demand

The development of digital new-quality productivity, driven by innovation as its core engine, relies on continuous breakthroughs in key technologies. Innovation capability, innovation resources, and incentive mechanisms serve as fundamental drivers for digital technological innovation. Insufficient innovation momentum will directly impact the progress of digital technological innovation. In terms of innovation capability, although China's digital technology has achieved rapid development, there remain gaps in core technological innovation. The country still lags behind international advanced levels in areas such as operating systems, industrial software, and high-end chips. Moreover, inadequate understanding of key common technological innovation has led to weak original innovation capabilities, severely constraining the enhancement of innovation capacity in critical common technologies [14]. Regarding innovation resources, the equalization of urban-rural sports public services driven by digital new-quality productivity urgently requires a group of interdisciplinary talents. Such professionals must possess in-depth knowledge of sports, proficiency in digital technologies, as well as strategic thinking, data-driven approaches, and cross-disciplinary integration capabilities. Currently, there is a severe shortage of digital sports professionals who understand both digital technologies and the actual development needs of sports, compounded by high training costs. In terms of incentive mechanisms, existing policies for technological innovation face issues such as disconnect between policy demands and implementation, lack of precision, coordination, and flexibility in government-led innovation initiatives, and insufficient matching of funding with policy intensity. Additionally, there are gaps in technological innovation management and evaluation mechanisms.

4.2 Pain Points in Management Optimization: Digital Decoupling and the Digital Divide

New productive forces have driven innovation and development in rural public digital cultural service models. Through the application of advanced technologies such as big data and cloud computing, innovative allocation of rural public cultural resources has been achieved [15]. Digital decoupling refers to the disconnect in information flow and resource sharing among sports management agencies, service providers, and enthusiasts during the equalization of urban-rural sports public services. This gap manifests not only in hardware infrastructure but also in software system compatibility and data standardization. The existence of digital decoupling severely hinders effective coordination and collaboration in urban-rural sports public services. On one hand, it prevents higher-level sports authorities from accurately understanding

grassroots service needs and operational realities, making it difficult to formulate scientific policies. On the other hand, grassroots institutions lack digital technical support, hindering efficient utilization of allocated resources and compromising service quality. The digital divide refers to significant disparities between urban and rural areas in digital technology mastery, application capabilities, and information access channels. While rural China has made notable progress in network infrastructure development, substantial gaps persist in digital technology adoption and popularization across both regions. Urban residents can easily obtain rich sports information and enjoy convenient sports services, while rural residents are difficult to enjoy the same sports welfare because of the information blockade and lack of services, which further aggravates the phenomenon of urban and rural sports public service inequality.

4.3 Dilemma of Model Upgrade: Three Chains Disembedded in Two Major Sectors

The interactive integration of innovation chains, industrial chains, and talent chains is crucial for promoting coordinated development between rural economies and digital sports services. However, current disconnections in these three chains across both sectors hinder collaborative innovation. Firstly, the digitalization of sports lags behind, with original innovations still falling short of international standards. While digital advancements in sports equipment progress rapidly, challenges persist in maintenance and data processing. Research institutions and universities lack effective coordination in data management and talent development databases, resulting in fragmented innovation, industrial, and talent chains [16]. The digital transformation of the sports industry has yet to achieve cross-sector collaboration, urgently requiring enhanced interdisciplinary cooperation to drive comprehensive innovation and development [17]. Secondly, rural sports face weak self-sufficiency and a shortage of service professionals. Currently, rural sports services primarily rely on government funding, which provides basic support for rural revitalization but limits long-term development due to insufficient self-sufficiency. Compared to urban areas, rural sports services exhibit significant gaps, necessitating new development models driven by the integration of three digital chains. Digital rural production and e-commerce are key directions to boost rural economic vitality. However, the current informatization rate of rural production stands at only 27.6%, with field cultivation at 26.4%, indicating substantial room for improvement in smart rural digitalization. Finally, rural e-commerce faces incomplete supply chain systems and a shortage of specialized professionals [18]. Although the 2025 Central Document No.1, "Guidelines on Further Deepening Rural Reforms and Advancing Rural Revitalization," explicitly calls for "promoting high-quality development of rural e-commerce," the digital transformation of rural e-commerce still faces numerous challenges. Rural areas continue to encounter significant obstacles in agricultural production, sales, and management, urgently requiring digital optimization of production factors and business models. Against this backdrop, the supply chain system for rural e-commerce remains underdeveloped, with talent shortages and poor coordination among stakeholders, all of which hinder the comprehensive development of the rural economy.

5 THE PRACTICE PATH OF EMPOWERING THE EQUALIZATION OF URBAN AND RURAL SPORTS PUBLIC SERVICES BY DIGITAL NEW QUALITY PRODUCTIVITY

5.1 Combining Institutional Incentives with Governance to Accelerate Industry-University-Research Collaboration in Digital Sports and Digital Rural Development

Through collaborative efforts among industry, academia, research institutions, and government in the sports and rural sectors, driven by digital technologies, we can effectively promote the deep integration and development of innovation chains, industrial chains, and talent chains. This accelerates the pace of innovation in core digital technologies and enhances the advancement of new digital productivity in these two fields [19]. Institutional incentives serve as the intrinsic driving force for such collaboration, while supervision and governance provide solid safeguards for its effectiveness. By fostering collaboration between industry, academia, research institutions, and government in these dual domains, we can accelerate the development of new digital productivity, drive coordinated progress between rural economies and digital sports services, and ultimately build a sustainable and healthy ecosystem of new digital productivity that promotes equal access to sports public services across urban and rural areas. First, regarding institutional incentives: On one hand, it is essential to explore and promote effective supply decision-making mechanisms to enhance innovation capabilities in digitally empowered fields. The application of digital platforms in sports public service provision can aggregate diverse sports resources, facilitate information flow, resource sharing, and deep integration among multiple stakeholders, effectively eliminate information barriers between supply and demand sides, and ensure precise matching between both ends. This process transforms the traditional one-way, decentralized, and non-systematic supply model of sports public services into a new paradigm characterized by multi-directional interaction, centralized efficiency, and refined service delivery [20]. On the other hand, it is crucial to improve policy frameworks and accelerate the construction of information platforms for industry-academia-research-government collaboration across various sectors. In the context of the new era, to deepen the integration of innovation chains, industrial chains, and talent chains, there is an urgent need to establish and optimize policy systems to expedite the development of information platforms for industry-academia-research-government collaboration in all fields. The state should focus on strengthening and expanding relevant policy frameworks, fully leveraging the leading role of governments at all levels in allocating scientific and technological resources, and enhancing guidance for industry-academia-research collaboration models [21]. Simultaneously, it should increase fiscal funding to effectively promote close integration and coordinated development among industry, academia, and research institutions. Secondly, in terms of supervision and governance, it is essential to improve the operational mechanisms of industry-academia-government collaboration to ensure the implementation of innovation cooperation activities. To more

effectively execute industry-academia-research policies, continuous refinement of the structure and operational mechanisms of industry-academia-research innovation alliances is necessary. This will serve as a foundation for establishing robust innovation systems in enterprises and industries [21]. During this process, emphasis should be placed on fostering the development of regional pillar industries, promoting in-depth collaboration among industries, higher education institutions, and research organizations, and jointly establishing collaborative platforms such as laboratories, research institutes, and engineering technology centers that can be utilized by all three parties. This initiative aims to foster diversified industry-academia-research cooperation and innovation models, thereby continuously enhancing the core competitiveness of all stakeholders in this field. Additionally, it is crucial to strengthen the supervision and governance of innovation collaboration to promote a virtuous cycle of scientific and technological innovation, talent cultivation, and industrial development. In advancing the balanced development of public sports services between urban and rural areas, industry-academia-government collaboration plays a pivotal role. However, significant risks and challenges exist in key areas such as project evaluation, fund management, and recognition of scientific achievements, which cannot be overlooked. Given this context, there is an urgent need to further refine and optimize relevant management systems, comprehensively establish accountability mechanisms, and vigorously strengthen supervision and management efforts. In order to ensure the steady and orderly progress of the process of the balance of public sports service in urban and rural areas, the responsible subjects should be strictly investigated and appropriately punished for the irregularities or negligence in the cooperation between industry, university, research institute and government.

5.2 Addressing Weaknesses and Enhancing Strengths with Minority Consideration: Elevating the Multidimensional Digital Application Level of Sports Public Services

Digital technology has created interactive channels for both public service providers and users, enabling comprehensive expression of multi-level public service demands. This advancement facilitates the establishment of an optimized "demand-side-supply-side" resource integration mechanism, effectively addressing information asymmetry in traditional service delivery and achieving precise spatial, content, and population targeting in public services [22]. Firstly, enhancing multi-dimensional digital application capabilities is pivotal in promoting equalization of urban-rural sports public services. This improvement involves not only technological innovation but also policy guidance, resource allocation, and talent development. To address digital gaps in rural sports services, targeted measures should be implemented. For instance, strengthening network infrastructure in rural areas to improve coverage and transmission speed lays a solid foundation for digital sports services. Meanwhile, smart sports platforms can integrate resources, streamline processes, and boost efficiency. In urban areas, deeper digital application is essential—such as leveraging big data to analyze user needs and provide personalized sports services. Additionally, expanding digital applications in live sports broadcasts and online fitness guidance meets the public's growing demand for diversified sports experiences. To consolidate achievements, continuous deepening of digital technology applications in sports public services is crucial. This drives technological and model innovation, creating replicable digital sports service benchmarks that serve as references for other regions. Secondly, in the process of enhancing multi-dimensional digital application levels, the needs of minority groups should not be overlooked. For special groups such as the elderly and people with disabilities, it is necessary to develop digital sports products and services suitable for their use, such as simplifying operational procedures and providing voice navigation functions, to ensure they can conveniently access sports services. At the same time, digital literacy education should be strengthened to improve the public's ability to apply digital technologies and narrow the digital divide. Secondly, the improvement of multi-dimensional digital application levels is of great significance for promoting the equalization of urban and rural sports public services. Firstly, it helps break geographical restrictions and achieve optimal allocation of sports resources. Through digital technology, information barriers between urban and rural areas can be overcome, enabling high-quality sports resources to be shared more widely, thereby narrowing the gap in sports services between urban and rural areas. Secondly, it helps enhance the convenience and personalization of sports services. Digital technology can provide customized sports services based on users' preferences and needs, meeting the sports demands of different groups and scenarios. Furthermore, it helps promote the innovative development of the sports industry. The application of digital technology has brought new growth points to the sports industry, such as the rise of new business models like online fitness and virtual competitions, providing strong support for the transformation and upgrading of the sports industry. Finally, it helps enhance public awareness of sports and promote the construction of a healthy China. Through digital sports services, sports knowledge can be more easily disseminated, inspiring public enthusiasm for sports and fostering a positive social atmosphere.

5.3 Joint Contract and Model Promotion: Building a Multi-level Supply System for Urban and Rural Sports Public Services

In the digital era, achieving equitable access to sports public services between urban and rural areas hinges on innovating and optimizing sports service systems, particularly through leveraging digital productivity to build efficient service delivery frameworks. First, establishing a digital health ecosystem and information-sharing mechanisms. Government authorities should enhance policy support for sports federations and county-level sports service communities, while creating behavioral guidelines and regulatory systems for digital health ecosystems. Standardized institutional designs should clarify stakeholders' rights and responsibilities, incentivize active participation, and promote resource sharing and collaborative innovation. In resource-scarce rural areas, implementing unified standards for digital infrastructure,

technical interfaces, and data-sharing protocols can significantly improve digital development. Governments must also provide necessary funding to ensure timely and efficient implementation of digital health ecosystems, maximizing the empowering potential of digital technologies in sports. Through interconnected information systems, rural residents can more easily access urban sports resources, fostering balanced development of sports public services across regions. Second, driving innovation and scaling up of sports service models. Tailored service standards should be developed based on regional needs, demographic characteristics, and geographical conditions. When promoting digital sports services nationwide, local variations must be fully considered, with customized service standards and implementation plans developed according to regional characteristics. The National Health Commission can play a pivotal role in this regard by issuing policy guidelines with operational guidance, clarifying the division of responsibilities among governments at all levels, sports service institutions, and the digital health community, and ensuring the effective implementation of innovative sports service models. To achieve this goal, it is also necessary to strengthen inter-regional coordination and cooperation, building a sustainable sports service network. Through systematic service delivery models, we can better meet the diverse sports needs of rural residents while optimizing the allocation of urban and rural sports resources, thereby promoting overall improvement in sports service quality. Third, enhancing policy safeguards and improving promotion mechanisms. National and local governments should encourage the development of multi-level and diversified sports service systems through special funds, fiscal subsidies, and tax incentives. At the same time, tailored service delivery measures should be implemented based on regional characteristics to ensure that sports services are precisely designed and implemented according to local conditions. For example, underdeveloped regions could prioritize infrastructure construction, talent training, and digital service upgrades, while areas with existing foundations could focus on innovating intelligent and personalized services to enhance service quality and coverage. Additionally, policies should emphasize incentive mechanisms to encourage active participation from enterprises, social organizations, universities, and other stakeholders in promoting and innovating digital sports services. By incentivizing various entities, particularly through rewarding and demonstrating exemplary cases, a virtuous cycle can be formed to continuously improve and deepen the sports service system.

6 CONCLUSION

In the context of rapid socioeconomic development driven by new productive forces, digital new productive forces serve as a crucial component. By empowering the equalization of sports public services between urban and rural areas, they address the persistent imbalance in sports service provision. Therefore, it is essential to leverage the logical synergy between these forces, tackle practical challenges, and implement comprehensive measures—from policy guidance to collaborative governance, from addressing weaknesses to supporting disadvantaged groups, and from establishing shared frameworks to scaling successful models. Efforts must be coordinated across technological, managerial, and operational dimensions to advance equitable sports services. As new productive forces continue transforming societal structures, future research should explore their driving mechanisms for urban-rural sports service equality, ensuring balanced development of China's sports public services to achieve the fundamental goal of nationwide fitness initiatives.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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