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The Realities and Prospects of Empowering Elderly Sports Participation through Sports Intelligence

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Abstract

The processes of population aging and digitalization have emerged as prominent features in China's social transformation and important focal points in the development of the sports field. This paper employs logical analysis, expert interviews, and other research methods to elucidate the necessity and significance of elderly sports participation and analyze the realistic challenges of empowering elderly sports participation through sports intelligence. The paper proposes the following prospects: a dual approach of promotion and services to embrace sports intelligence, the proactive provision of age-appropriate services to showcase the benefits of technology, the establishment of government support networks to stimulate market vitality, and the acceleration of talent resource development to create a talent hub. These prospects aim to overcome the digital divide among the elderly, promote equitable access and utilization of sports intelligence technology, and facilitate the high-quality development of elderly sports.

Keywords

Sports Intelligence; Elderly Sports; Population Aging; Nationwide Fitness.

1. Introduction

In recent years, there has been a noticeable rise in the diverse demands for sports consumption among the general public. Consequently, the development of sports wearable devices and intelligent sports environments has been rapid. The integration of artificial intelligence (AI) with sports, particularly in the context of nationwide fitness, has gained visibility among the public [1]. In the era of digital intelligence, the transformation towards digitization has become an essential and practical choice for advancing the field of sports. The combination of AI and sports represents an inevitable trend. However, there are significant obstacles that hinder the elderly from participating in sports intelligence. With the increasing severity of population aging in China, the vigorous development of sports for the elderly through smart technology is not only a pressing desire among the elderly population, but also a crucial measure to address the challenges posed by population aging, promote the establishment of a "Healthy China," and enhance the provision of elderly care services [2]. Presently, research and practical applications of intelligence technology-enabled smart training are still in the exploratory stage in China, with a notable scarcity of studies specifically focusing on empowering the elderly through sports intelligence. Confronted with the contradiction between the growing demand for sports among the elderly and the insufficient availability of sports resources and services, it is worthwhile to explore how to leverage the power of technological innovation. By harnessing the advantages of quantification, visualization, and real-time capabilities offered by sports intelligence, it is possible to address the shortcomings in elderly sports services and promote the scientific and intelligent participation of the elderly in sports, thereby providing them with support, purpose,

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and enjoyment during their senior years. This presents a novel research topic that merits further investigation.

2. The Connotation and Development of Sports Intelligence

Sports intelligence represents the cutting-edge application of new-generation information technologies, such as the Internet of Things, big data, and cloud computing, in the sports field [3]. By creating a digitized, networked, and intelligent sports environment, sports intelligence significantly enhances the quality of sports services, facilitates the transformation and advancement of the sports industry, and effectively meets people's diverse sports demands. The development of sports intelligence can be categorized into stages of sports informatization, sports digitization, and sports intelligence [4]. In China, the development of smart sports commenced in the 1990s. With the emergence of the big data era, the rapid progress of algorithms, and the increasing aspiration for a better quality of life, the demands for sports services have become more complex, diverse, and personalized. The integration of artificial intelligence with traditional sports has given rise to an unprecedented trend in development. Sports training will leverage mature artificial intelligence technologies to design more comfortable and convenient smart devices and develop a wider range of intelligent algorithms. Through the comprehensive analysis and application of various technologies, it establishes an "intelligent bridge" that connects theoretical research and practical implementation of training plans. Moreover, it provides intelligent feedback and decision support to address various diverse needs, thereby achieving the intelligent development of sports training [5].

As a strategic resource and a generative element, "sports intelligence" serves as a key driver of quality, efficiency, and dynamic changes across various fields. It represents a seamless integration of information technology and sports, characterized by unity and diversity [6]. As an emerging form of sports, sports intelligence plays a significant role in areas such as sports teaching, sports training monitoring, sports biochemistry research, sports event management, sports equipment development, and sports culture dissemination. It propels the advancement of sports disciplines, and its vast potential for future development is undeniable [7]. Sports intelligence events have become an integral component of many prestigious international competitions, offering diversity, entertainment, and adaptability. They attract a global audience and cater to the diverse needs of different populations, effectively promoting nationwide fitness [8]. With the continuous maturation of new technologies like artificial intelligence and virtual reality, the integration of predominantly intelligent elements into sports will showcase comprehensive, multidimensional, and diversified development trends. Through innovative competition formats and sports modes, users can seamlessly merge visual, auditory, tactile, and physical experiences, captivating the attention of various sectors of society [9].

3. Importance and Significance of Elderly Sports Participation

3.1. Current Status and Trends of Population Aging in China

China is currently facing a substantial and accelerating population aging phenomenon, characterized by a large-scale aging population, rapid increase in age, higher prevalence of empty-nest elderly, aging before becoming affluent, and an increased burden of elderly care. As of the end of 2022, the elderly population in China has reached 210 million, and the pace of population aging has reached unprecedented levels [10]. Previous data indicates that from 2016 to 2022, the birth rate in China has continuously and rapidly declined, dropping from 12.95% to 6.77%. Furthermore, the population growth rate has sharply declined, and in 2022, the overall population has shown a negative growth trend with a natural growth rate of only -0.6%. The population structure in China is transitioning from being adult-oriented to elderly-oriented. Influenced by the established population structure, the process of population aging in

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China is challenging to reverse. It is projected that by 2035, the proportion of people aged 65 and above will exceed 25%, and by 2050, it will surpass 35%. The peak of the population aged 65 and above in China is estimated to reach 425 million by 2057. Currently, the number of disabled elderly individuals caused by population aging in China is approximately 40 million, with 12 million being completely disabled. The incidence of chronic diseases increases with age, which will have comprehensive, sustained, and profound impacts and challenges on social and economic development.

Population aging is a global issue that accompanies modernization, continuous improvement in people's quality of life, and the extension of human life expectancy [11]. Under the trend of population aging, the non-healthy elderly population is expanding, the family elderly dependency ratio is increasing, and there is an increasing strain on national healthcare and care resources. Consequently, there is a significant increase in the demand for public sports services for the elderly [12]. The development of elderly sports contributes to the promotion of socialist spiritual civilization. It not only expands the living space for the elderly and sustains their social engagement but also fills the role gap caused by retirement, allowing the elderly to continue playing a social role while creating social value and living a fulfilling life. Optimizing the level of elderly sports services is an important means to improve the physical and mental health of the elderly. Developing elderly sports in the context of population aging is not only a strategy to actively address the challenges of population aging but also serves as a foundation for achieving national health goals. Sports, as a low-cost and non-pharmaceutical approach, possesses unique charm in addressing population aging. It brings not only economic benefits but also sustainable development momentum, making it of strategic significance.

3.2. The Importance and Value of Elderly Sports Participation

The 2022 Government Work Report proposed the active response to population aging, optimization of urban and rural elderly care services, and promotion of high-quality development in the elderly care industry. Since the 18th National Congress of the Communist Party of China, the nation has elevated nationwide fitness and active response to population aging as a national strategy, with enhancing people's physical fitness and improving health levels as the fundamental goals of sports work [13].The introduction of key documents such as the "Opinions of the Central Committee of the Communist Party of China and the State Council on Strengthening Work on Aging in the New Era," the "Medium- and Long-Term Plan for Active Response to Population Aging," the "Healthy China 2030 Plan Outline," and the "National Fitness Plan (2021-2025)" has stimulated the development of related industries, including sports and elderly care services, progressively deepening the awareness of "silver-haired fitness" and "scientific fitness." Enabling digital empowerment in public sports services for the elderly represents a significant means of advancing it to a higher level [14]. The "Opinions on Strengthening Work on Aging in the New Era" explicitly states that effectively responding to population aging in our country is related to the overall development of the nation, the well-being of hundreds of millions of people, and is of great significance to the comprehensive construction of a socialist modern country. General Secretary Xi Jinping emphasized that sports are an essential means of improving people's health, satisfying their aspirations for a better life, promoting comprehensive human development, driving economic and social progress, and showcasing the country's cultural soft power. Implementing the national strategy of actively responding to population aging, reducing the burden of aging on families and social resources, represents a concrete manifestation of the new development concept and contributes to the modernization of the national governance system and governance capacity [15].

Elderly sports work is a crucial component of China's elderly care and sports endeavors, playing an irreplaceable role in promoting a positive and modern outlook on life, enhancing the social cognitive abilities of the elderly, delaying the effects of aging, preventing and treating chronic

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diseases, and advancing the frontiers of health [16]. From the macro perspective of national development, elderly sports can alleviate the social contradictions arising from the dual trends of population aging and rapid economic development. They hold significant strategic significance in meeting people's livelihood needs, promoting social harmony and development, effectively implementing the national fitness plan, and developing the elderly sports industry. From the micro perspective of individual elderly individuals, elderly sports contribute to improving the physical health of the elderly, directly and significantly benefiting their life satisfaction and fostering intergenerational harmony. Intelligent electronic devices in sports integrate portability, aesthetics, and functionality. Through data collection and analysis, these smart devices provide accurate analysis and real-time management of the health data of the elderly. They enable dynamic monitoring and effective health assessment in areas such as heart rate, blood pressure, and aerobic fitness while considering individual differences, offering scientific exercise guidance. They optimize the forms of elderly sports participation, improve performance and quality, enhance the enjoyment of elderly sports activities, and promote lifelong sports engagement.

4. The Realistic Challenges of Empowering Elderly Sports Participation with Sports Intelligence

4.1. The Overall Low Level of Digitalization among the Elderly

Sports intelligence, with its new digital logic, accelerates the operation and development of sports, enhancing the efficiency, scientificity, and convenience of sports participation for the general population. While most young people enjoy the "technological empowerment" brought by the digital dividend, it has also introduced "technological disempowerment" effects for the elderly, and even created new barriers to their sports participation[17]. Elderly individuals face varying degrees of operational obstacles in areas such as community smart fitness equipment, online sports venue reservations, virtual cycling events, esports, and nationwide smart fitness competitions. The theory of technology diffusion suggests that complexity is a major barrier to technology adoption and usage. In the intersection of aging and digitalization, the use of sports smart electronic devices poses two main challenges for the elderly. On one hand, there are access barriers. According to the 51st statistical report released by CNNIC as of December 2022, internet users aged 50 to 59 account for 16.5% of the total internet users in China, while internet users aged 60 and above only account for 12.2%. Although the report indicates further penetration of the internet among middle-aged and elderly populations, the overall coverage of wireless networks and smart internet devices among the elderly remains low. The disadvantage in terms of user base is still a significant issue, particularly in relatively underdeveloped regions where wireless internet coverage is extremely limited. On the other hand, there are usage barriers. From the perspective of new media characteristics, the elderly not only need to acquire skills for accessing relevant information but also require skills to utilize new media technologies to fulfill their diverse sports-related needs. Some sports smart devices are complex in functionality, and the elderly's usage skills often fall short of meeting their demands.

Compared to the younger population, elderly individuals have substantially lower overall digital literacy, and their usage scenarios and scope of digital sports are relatively restricted. They lack the ability to expand their proficiency in areas such as data recording, data analysis, and customized functionalities. Additionally, they demonstrate a biased understanding and attitude towards the digital realm, struggling to discern and handle information authenticity. Elderly individuals are more susceptible to becoming victims of scams. Many elderly individuals perceive the negative impacts of the internet as outweighing the positive aspects, leading to psychological and behavioral resistance, wherein they prioritize the drawbacks over

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the benefits. Overall, the low level of digitization among the elderly is influenced by factors such as psychological attitudes, operational complexity, and economic capabilities. Consequently, it becomes arduous for the elderly to shed the label of "digital refugees," and their enthusiasm and interest in sports intelligence gradually wane, resulting in inadequate protection of the rights and interests associated with sports intelligence [18].

4.2. Insufficiencies in Age-Friendly Characteristics of Sports Intelligence Products

The rapid advancement of sports intelligence technology has sparked a new wave of technological revolution, and the introduction of intelligent sports products by sports enterprises has played a significant role in supporting sports activities. Intelligent sports products, particularly sports monitoring devices, effectively monitor and guide the participation of elderly individuals in sports. However, there currently exist digital divides and generational disparities in the involvement of elderly individuals in sports intelligence public services. A practical contradiction in the development of elderly sports lies in the mismatch between the urgent demand for sports intelligence devices among the elderly and the insufficient technical support provided by dedicated sports intelligence platforms tailored to their needs. Consequently, the ownership and accessibility rates of sports intelligence products among the elderly remain low, making it challenging for a majority of elderly individuals to fully engage in the realm of sports intelligence.

Innovation serves as the primary driving force. As key players in the innovation of technological solutions for public sports services in China, sports enterprises play a crucial role in determining the application of digital technologies among the elderly, guided by the effectiveness of their technological innovation and investment. Research reveals that the primary reason for the limited demand for smart devices among the elderly is the predominant focus of product development and design on a younger audience. This results in complex device operations and a lack of specific design features that cater to the perspectives of the elderly, such as modes specifically designed for the elderly, simplified operation modes, and sections dedicated to older adults. Additionally, as a digitally vulnerable group, elderly individuals often lack awareness of data security and are susceptible to the influence of "miracle" fitness advertisements. They are also more susceptible to adverse impacts such as health scams, sports betting, telecommunication fraud, and false advertising. Moreover, the current state of sports intelligence is characterized by information overload and low-quality sports information, which, coupled with a series of negative consumer experiences, contributes to a negative perception among elderly individuals towards smart sports. Contrary to common assumptions, the elderly did not grow up in the internet era and possess limited internet skills. Furthermore, due to their outdated perspectives on sports consumption, enterprises seldom consider elderly individuals as a primary target customer group in the creation and development of intelligent sports devices. As a result, there is a disconnect between intelligent sports devices and the elderly population, making it challenging for elderly individuals to fully experience the benefits of technology in sports activities.

4.3. Enhancing Support for Public Services in Sports Intelligence for Elderly Sports

The future will witness a growing and unyielding demand for services related to elderly sports and health, which will subject the existing mechanisms of elderly sports services to unprecedented challenges. Currently, the development of elderly sports in the context of population aging presents several practical contradictions. These contradictions encompass the disparity between the initial display of exercise enthusiasm among elderly individuals and the inadequate supply of services, the contradiction between the surging exercise enthusiasm of elderly individuals and the lack of sports organization and management, and the

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contradiction between the strong desire of elderly individuals to engage in sports activities and the limited availability of scientific exercise knowledge. Artificial intelligence technology contributes to enhancing the quality of elderly individuals' sports participation and paves the way for their access to sports intelligence technology. Although there has been some progress in public services for elderly sports with the introduction of documents like the "Action Plan for the Development of the Smart Health and Elderly Care Industry (2021-2025)," the scarcity of regulations, institutional frameworks, and top-level policy designs pertaining to the digitization and intelligence of public services for elderly sports in our country hinders effective strategic guidance for aging sports intelligence. Consequently, it becomes challenging to genuinely safeguard the rights and interests of elderly individuals in their participation in sports intelligence.

The primary challenge in empowering elderly individuals in sports through sports intelligence lies in the inadequate digital infrastructure of public services for elderly sports [19]. On one hand, there is a limited overall scale, and there is an imbalance in the development between urban and rural areas. The digital infrastructure for public services in elderly sports is predominantly concentrated in regions such as Shanghai, Zhejiang, and Shandong, with significant disparities in resource allocation between urban and rural areas. On the other hand, there is an excessive focus on "hard" infrastructure, particularly in the construction of smart venues, while neglecting the necessary scientific guidance and consulting services. This leads to issues such as underutilization of resources, ineffective supply, and an oversupply of smart venue facilities [20]. Furthermore, there is a low level of symmetry between supply and demand, resulting in inadequate adaptability. The demand for public services in elderly sports, driven by government interests and performance-oriented approaches, often diverges from the genuine sports aspirations of elderly individuals. As a result, there is a lack of prioritized supply based on the importance of demand, a deficiency in personalized services, and a failure to develop unified and rational service plans for elderly individuals with different age levels, physical abilities, and living conditions. Consequently, there are discrepancies in service content, format, and scope. Additionally, the establishment of digital information platforms and feedback mechanisms lacks sufficient connectivity. The elderly population lacks effective channels for providing feedback on sports intelligence public services, with the current channels primarily limited to hotlines or complaint boxes. During the process of recording needs and suggestions, personal subjectivity of personnel can introduce distortions in information transmission and result in low accuracy in addressing information demands. Therefore, it is crucial to expand channels for expressing demands and gathering feedback from the elderly population in the realm of sports intelligence public services.

4.4. Enhancing the Quantity and Quality of Professional Guidance for Sports Intelligence

With the issuance of the "Next Generation Artificial Intelligence Development Plan" and the emergence of Chat Gpt and information communities, artificial intelligence has transitioned from the confines of the laboratory to real-world applications [21]. The continuous advancement of sports intelligence manufacturing, wearable sports devices, sports events, and sports e-sports as digital mediums has facilitated their utilization in sports. These technologies enable targeted tracking and analysis of individual goals, as well as systematic analysis of collective project strategies and tactics. They have the potential to assist in daily sports training and accommodate group-specific differences through the utilization of personalized intelligent devices.Given the declining physical abilities of elderly individuals compounded by the challenges posed by diseases, professional guidance is essential to mitigate the risk of sports injuries resulting from improper exercise. In China, guidance for elderly individuals in sports is predominantly divided into two categories: professional guidance, provided by school physical

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education teachers, social sports instructors, fitness coaches, and the like; and non-professional guidance, encompassing self-study, voluntary participation in public welfare activities, and sports enthusiasts. To effectively leverage sports intelligence for the elderly population, it is imperative to cultivate professionals in the field of sports intelligence. However, there is a scarcity of universities in China offering digital sports programs, and the discipline and knowledge system in the field of digital sports, as an emerging academic discipline, remains incomplete.Talent cultivation faces various challenges, including unclear training objectives, insufficient digitization, and a shortage of teaching staff. Additionally, there is a lack of interdisciplinary collaboration between sports and computer science, resulting in sports professionals lacking computer technology skills while computer professionals lack expertise in sports-related knowledge, thereby hindering effective synergy. Moreover, there is significant room for improvement in guiding and serving elderly individuals in sports within China. Elderly sports services demand guidance personnel with comprehensive skills, encompassing professional expertise in sports, sports rehabilitation, medical care, dietary nutrition, and other related domains. Additionally, professionals engaged in research and development, innovative design, and subsequent maintenance of smart sports products are essential. It is evident that individuals possessing the expertise to provide guidance in sports intelligence services for the elderly are scarce in light of these circumstances.

Since the implementation of the Social Sports Instructor Technical Grade System in China in 1993, the number of personnel has steadily increased, yet their impact has been limited. Japan, with only one-tenth of China's total population, boasts over 100,000 social sports instructors, constituting ten times the ratio to the total population compared to China. While social sports instructors voluntarily offer sports services to the public without financial compensation, those with professional qualifications primarily focus on school physical education or engage in other occupations. Consequently, the probability and opportunities for voluntarily guiding elderly individuals are low, leading to an extremely limited availability of professional guidance in sports intelligence. Thus, the scarcity of sports professionals combined with the dearth of quality guidance significantly impedes the application, dissemination, and development of sports intelligence.

5. Enabling Elderly Sports Participation through Sports Intelligence: Prospects

5.1. Dual Approaches for Promoting and Facilitating Sports Intelligence

In April 2022, the General Administration of Sport of China issued a notification titled "Implementation Plan to Address the Challenges Faced by the Elderly in Utilizing Intelligent Technologies," underscoring the need to overcome the difficulties encountered by the elderly in adopting sports intelligence technology. The 20th National Congress of the Communist Party of China report emphasizes the importance of proactive strategies to tackle the issues arising from an aging population [22]. In the context of population aging, the development of elderly sports is an inevitable trend. Achieving a new level of nationwide fitness necessitates integration with the prevailing era and meeting the demands of the people. Therefore, it is imperative to pay sufficient attention to the utilization of digital media among the elderly. Efforts should be made to assist the elderly in keeping pace with technological advancements, selecting suitable sports intelligence devices, transforming the nature of sports participation, gradually bridging the digital divide, and enhancing their digital literacy.

On one hand, establishing a comprehensive promotional system is essential. Leveraging the speed and breadth of information dissemination through the internet, it is crucial to guide the elderly in understanding, utilizing, and benefiting from sports intelligence, thereby enhancing its feasibility. Promotional activities should focus on the channels, resources, and methods of

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engaging with sports intelligence, guiding the elderly to recognize its value and fostering a comprehensive awareness of active health among them [23]. Bridging the digital divide for the elderly in the realm of digital sports is a mutually interactive process. It requires not only the acceptance and inclusiveness of the external environment but also the elderly's recognition of the sports intelligence trend at the psychological, cultural, and behavioral levels. The elderly should establish a correct perspective on sports and consumption, enhance their digital cultural literacy, participate in diverse sports and health programs based on their own circumstances, and engage in practical actions within the domain of sports intelligence. This will provide them with more opportunities and space for integration into modern society.

On the other hand, constructing a service ecosystem that enables the elderly to enjoy sports intelligence is of utmost importance. Integrating the elderly into digital sports necessitates attention to policy and community services [24]. The outline of the 14th Five-Year Plan emphasizes the need to adapt to the comprehensive integration of digital technology into social interactions and daily life, presenting a fresh opportunity to address the shortcomings in the digitalization of nationwide fitness. By taking the lead as a "model for digitalized nationwide fitness," promoting sports intelligence for the elderly should be considered a key initiative to improve their smart service experience. The government should spearhead the promotion of smart community development and the establishment of a service ecosystem that offers accessible smart sports solutions for all. Leveraging digital platforms within communities, a series of "Elderly Sports Intelligence+" training activities should be provided to disseminate a healthy and positive sports culture. This would enable online training to empower offline participation, optimize cost structures, and increase the coverage of the elderly population. Community volunteers should offer elderly-friendly sports venues, sports intelligence events, and guidance for exercise training, providing accessible and beneficial services that help the elderly overcome the challenges associated with digital sports [25].

5.2. Enabling Proactive Services for the Elderly: Demonstrating the Potential of Technology

The increasing prevalence of an aging population presents significant market development opportunities and potential for elderly sports, making the demand for age-friendly sports products essential. Enterprises should prioritize market research in the field of elderly sports and utilize intelligent sports products to monitor and ensure the safety of elderly individuals' participation in sports activities, thereby enhancing their sense of happiness, achievement, and security in the "smart era" [26]. The integration of sports intelligence in the sports industry can effectively reduce production, management, transaction, and operational costs, while also improving resource allocation, capital utilization, and labor productivity. In addition, enterprises should introduce new consumer experiences such as precision services, personalized customization, and online/offline services to enhance the quality and efficiency of their products [27]. Based on the principles of technology acceptance theory, the elderly will be more inclined to accept and utilize new technologies when they perceive the convenience and benefits offered by intelligent technology. At the enterprise level, data analysis should be employed to focus on the physical and mental well-being of the elderly, account for individual differences among this demographic, and leverage advanced scientific and technological means to develop comprehensive service solutions that are intelligent, efficient, and of high quality [28]. By ensuring the accuracy and security of data, while considering the fundamental and individualized needs of the elderly in sports, a novel model of elderly sports exercise can be established, integrating elements such as "sports foundation assessment, physical health reports, personalized training, performance analysis, information feedback, and crisis intervention." This holistic approach will enable the elderly to recognize the supportive role of

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sports technology products in their exercise routines and facilitate their acceptance of digital media on both psychological and behavioral levels.

The introduction of sports intelligence aims to implement the national strategy for nationwide fitness and foster the development of the sports service industry, necessitating a scientific forecast of trends in the elderly sports market [29]. It is crucial to identify and address the changing demands and challenges faced in elderly sports, leveraging high-quality sports intelligence products to shape the consumption concepts of the elderly. Considering the unique characteristics of the elderly population, including declining cognitive abilities and varying degrees of impairments in perception, memory, and attention, the design of sports intelligence products should prioritize age-friendly considerations. A comprehensive service blueprint should be developed through long-term planning, encompassing the user experience of the elderly, data security measures, content formats, and service scenarios. The selection of sports intelligence functions more suited to the elderly should be targeted and aligned with their specific needs during the product design process. Furthermore, efforts should be made to accelerate the development of barrier-free information services, incorporating features such as voice reading, font enlargement, and specialized care modes for the elderly. These enhancements can assist the elderly, disabled individuals, and others in accessing and engaging with digital life, reducing the sense of disorientation associated with sports intelligence devices, and ultimately enhancing the accessibility and utilization rates of information technology [30].

5.3. Building Government Support Networks to Stimulate Market Vitality

Since 1994, the Chinese government has formulated a series of policies and regulations related to sports, which have played a guiding role in the development of elderly sports. However, with the integration and development of sports intelligence, it is necessary to strategically plan and lay out the future development of elderly sports intelligence from a national strategic perspective, seeking feasible strategies that are in line with the current times. Promoting fairness in digital sports for the elderly and safeguarding their digital rights requires the attention and concerted efforts of the government, enterprises, and society. It is crucial to encourage the elderly to understand, utilize, and benefit from intelligent sports, maximizing the positive impact of intelligent sports on their well-being [31].

Firstly, it is important to improve the investment mechanism for digital sports infrastructure. Addressing issues such as regional disparities and imbalances in the supply of digital infrastructure between urban and rural areas requires sound top-level design. The focus should be on meeting the actual public service needs of the elderly in sports. Improving fiscal and taxation policies related to digital software engineering and effectively mobilizing market capital through third-party policy incentives are essential. A collaborative model led by the government, with social assistance and corporate investment, should be established to mobilize funding for elderly sports activities through multiple channels. This funding should be utilized to expand the scale and improve the supply level of digital infrastructure. In the early stages of digital software development, tax relief policies and research and development funds for core projects should be utilized to mitigate market and enterprise research and development risks. This will encourage capable companies to enter the elderly sports market and attract technology and sports enterprises to focus on designing, developing, and innovating sports intelligence products, bringing economic benefits to society and driving the upgrade of elderly sports products [32].Secondly, it is necessary to establish a comprehensive system for demand data inventory platforms. Region-specific databases should be built to exclusively cater to the public sports service needs of the elderly. These databases should strengthen data collection and monitoring, accurately identify the challenges and genuine needs of the elderly, and leverage the power of society through data networks to provide suggestions and contribute ideas. This will enable precise clustering of demands for intelligent sports services for the

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elderly. Additionally, data analysis techniques can be employed to analyze data from the perspective of evolving attention, clarifying patterns of demand changes and preference characteristics among the elderly population. By fully utilizing the advantages of big data, new demands can be uncovered and identified [33].Furthermore, efforts should be made to improve the quality of guidance in elderly sports services. The government should take the lead in establishing dedicated and part-time sports intelligence guidance platforms, while enhancing digital skills education and training. Creating social sports instructor positions within communities can transform the roles of volunteers into professional practitioners, effectively harnessing the potential of community instructors. By bridging the gap between the community and educational institutions, platforms can be provided for internships, teaching, voluntary services, and club activities for sports majors. This will create an intelligent and vibrant landscape for sports life, enabling specialized and regular guidance for the fitness needs of the elderly population.

5.4. Accelerating the Development of Talent Resources to Establish a Talent Hub

At present, there exists a significant disparity between the development level of sports intelligence in China and the strategic demands of the nation, such as outlined in the "Healthy China 2030" plan, aimed at building a robust sports nation. The primary cause of this disparity is the inadequate recognition of the importance of sports intelligence among the general population. It is projected that by 2031, there will be over 5 million elderly individuals in China who will require professional guidance in their sports activities. To effectively incorporate sports intelligence technology into elderly sports participation, it is imperative to invest in talent to ensure the provision of high-quality and efficient services. The establishment of a high-caliber talent pool in the field of "sports + intelligence" serves as a solid guarantee for the prosperous development of sports intelligence. Thus, it is necessary to construct a comprehensive team of professionals in sports intelligence, as a prerequisite for promoting nationwide fitness through sports intelligence and facilitating the integration of the elderly into the realm of sports intelligence [34].

Firstly, there is a need to strengthen the teaching staff and enhance discipline construction. In terms of the teaching staff, a forward-looking perspective should be adopted, along with increased financial subsidies and special funds allocated to complete the establishment of think tanks, thereby promoting the cultivation of versatile talent in sports intelligence. By combining approaches of "importing talent" and "exporting talent," efforts should be made to attract urgently needed professionals while simultaneously reserving talent for future requirements. Training organizations should be improved for "digitizing physical education teachers" and "digitalizing teachers' physical education," with an emphasis on interdisciplinary training to enhance discipline construction. Collaborative efforts between computer science teachers and physical education teachers should be encouraged to foster a virtuous interaction between "teaching" and "learning," ultimately strengthening the development of a high-quality team of digital physical education teachers.Secondly, sports universities should clarify their training objectives and enhance practical teaching. This can be achieved by fostering students' practical abilities and facilitating the application of acquired knowledge to teaching and management. In line with the needs of social sports talent, resource integration and platforms should be established to provide simulated internships, practical facilities, voluntary services, and professional teaching competitions. These initiatives aim to enhance students' comprehensive capabilities and nurture talents capable of independently engaging in the field of digital sports education, meeting the demands of sports technology in the new era [35]. Furthermore, as advocates for nationwide fitness, guides for scientific fitness, organizers of mass fitness activities, and leaders of a healthy lifestyle, social sports instructors play a vital role in guiding

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elderly individuals in their sports endeavors [36]. Therefore, the training process for social sports instructors should incorporate practical sessions on sports intelligence guidance. Adhering to principles of targeting the elderly, emphasizing service standards, and focusing on practical effectiveness, tailored exercise and fitness programs, as well as guidance services, should be provided for the elderly. Activities such as lectures, salons, and team-building exercises can be utilized to fulfill the roles of "guidance," "assistance," and "promotion of learning," enabling the elderly to transition from perceiving the negative aspects of sports intelligence technology to recognizing its empowering aspects.

6. Discussion

Enhancing the Impact of Sports Intelligence on Elderly Sports: Opportunities and Challenges.Each new technology emerges with a captivating appeal, and in the era of artificial intelligence, the trend of human-machine integration is becoming increasingly pronounced. The future prospects of sports intelligence are even more anticipated. Sports intelligence not only represents an innovative application of emerging technologies that align with the current developmental landscape, but also represents an inevitable choice for propelling elderly sports into new horizons. The diversification of product and service offerings, combined with the diverse needs of the elderly population, has significantly transformed the original dynamics of supply and demand in public sports services for the elderly. The promotion of sports intelligence has facilitated a transformation and upgrade in the developmental model of elderly sports, presenting a plethora of opportunities and challenges. The existence of a digital divide among the older generation is a reality. As the empowerment of sports intelligence for the elderly is still in its exploratory stage and potential shortcomings in the promotion of sports products stemming from new technologies may arise, it is imperative to prioritize government leadership, foster innovation within enterprises, cultivate specialized talent, and provide exceptional community services. Through collaborative efforts among multiple stakeholders, the integration of sports intelligence into elderly sports participation will progressively demonstrate greater depth and breadth.

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