From "National Fitness" to "Digital Fitness": The Paradigm Shift and Logical Reconstruction of Sports Participation under Technological Empowerment

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Abstract: The deep embedding of digital technology is triggering a fundamental transformation in sports participation. From the perspectives of the sociology of technology and the sociology of the body, this paper reveals the paradigm shift from "national fitness" to "digital fitness" and its underlying logic. The study finds that this shift is reflected in four dimensions: the concept of exercise shifts from a means of health maintenance to data-driven practice, with the body quantified into a traceable digital mirror; the mode of participation shifts from presence to online connectivity, as technology breaks physical boundaries and constructs decentralized, personalized forms of participation; the logic of social interaction shifts from geographically based communities to interest-based tribes, with community cohesion shifting from shared physical presence to shared focus; the experience of time and space shifts from singular to a superposition of the virtual and the real, with exercise trajectories permanently preserved, creating an intertwined participatory experience. However, behind this paradigm shift lie multiple tensions: the digital divide places the elderly, rural residents, and low-income groups at risk of marginalization; data commodification may dissolve individual autonomy in exercise, reducing behavior to an object of algorithmic optimization; technological alienation may lead to data dependence and algorithmic bias, overshadowing the humanistic value of exercise. Promoting the healthy development of digital fitness requires seeking balance between technological innovation and social inclusion, accelerating the universal accessibility of infrastructure, strengthening digital literacy education, improving data governance mechanisms, and integrating humanistic considerations into technological design. Only in this way can the transition from "national fitness" to "digital fitness" truly become a positive force for promoting public health and enhancing social well-being.

Keywords: National Fitness; Digital Fitness; Technological Empowerment; Sports Participation; Paradigm Shift; Digital Divide

1. Introduction

As a cornerstone of the Healthy China initiative, national fitness has long carried the policy expectation of improving public health and promoting social integration. From the promulgation and implementation of the "Outline of the National Fitness Program" in 1995 to the development goal of "creating a social atmosphere for national fitness" clearly stated in the "National Fitness Program (2021–2025)" in 2021, China's national fitness cause has undergone a process of evolution from advocacy to institutionalization, and from localized promotion to universal coverage. Throughout this process, the content and scope of sports participation have continuously expanded, and the relationship between sports and health, as well as between sports and daily life, has become increasingly close.

However, the rapid development of digital technology in recent years is profoundly changing the forms and logic of sports participation. Digital sports products and services such as smart bracelets, sports apps, virtual events, and cloud-based fitness are emerging one after another. Technology is no longer merely an external auxiliary tool for sports participation but is gradually integrating into the core aspects of physical activity, reshaping the fundamental logic of "why people exercise," "how they exercise," and "with whom they exercise." This change is not simply an upgrade of tools but signifies the rise of a new form of sports participation—"digital fitness"—and its corresponding paradigm shift.

From an academic research perspective, the

issue of sports digitalization is receiving increasing attention from scholars. Some researchers propose from the perspective of digital governance of public sports services that China's public sports services are undergoing a process of evolution from "technological empowerment" to "holistic reshaping," which is significant for adjusting multi-actor governance relationships and improving service supply efficiency. Other studies analyze sports digitalization from a stakeholder perspective, pointing out that digital technology has widely influenced diverse stakeholders such as athletes, coaches, referees, and spectators. However, existing research still pays insufficient attention to non-competitive subjects (such as administrators, referees, and spectators), and the exploration of how digitalization affects the behavior of various stakeholders during events also requires further investigation. In the international academic community, the introduction of the "Sports Industry 5.0" concept further links sports digitalization with issues of humanism, sustainability, and social equity, emphasizing that technological development should not only pursue efficiency and performance but also focus on human well-being and ecological health.

Against this backdrop, this paper adopts an interdisciplinary perspective from the sociology of technology and the sociology of the body, aiming to reveal the internal logic and structural characteristics of the transition from "national fitness" to "digital fitness." Specifically, this paper attempts to answer the following questions: How does digital technology reshape the conceptual foundation of sports participation? What transformations have occurred in the modes of participation, social interaction logic, and temporal-spatial experiences of sports participation? What tensions and challenges lie behind this paradigm shift? By exploring these questions, this paper hopes to provide a theoretical framework for understanding the new forms of sports participation in the digital age and offer academic support for promoting the digital transformation of national fitness.

2. Literature Review and Theoretical Framework

2.1 Multidimensional Perspectives on National Fitness Research

As a vital component of China's sports endeavors, national fitness has long received extensive attention from academia. Existing research mainly unfolds from the following dimensions: First, the policy and institutional perspective, exploring the evolution, policy effects, and implementation pathways of national fitness programs. By analyzing policy texts from different periods, researchers reveal the trajectory of functional expansion from "physical enhancement" to "health promotion" and then to "social integration." Second, the participation behavior perspective, focusing on the characteristics, influencing factors, and trends of physical exercise among different populations. Such studies are mostly based on large-scale survey data, employing quantitative methods to analyze the relationship between variables such as age, gender, urban-rural residence, education level, and sports participation. Third, the health effect perspective, examining the positive effects of physical exercise on physical health, mental health, and social adaptation, providing empirical evidence for policy advocacy in national fitness. These studies collectively depict a multidimensional picture of national fitness, laying a solid foundation for understanding the social significance of sports participation.

However, most of the above studies treat "sports participation" as a relatively fixed behavioral category, paying insufficient attention to the potential transformations in participation forms that technological changes might trigger. With the widespread penetration of digital technology, the boundaries of sports participation are blurring and forms are becoming increasingly diverse, challenging the explanatory power of traditional research frameworks.

2.2 Interdisciplinary Research on Digital Technology and Sports Participation

In recent years, interdisciplinary research on digital technology and sports participation has gradually increased, forming several important academic growth points.At the level of technological application, researchers focus on how technologies such as wearable devices, sports apps, and virtual reality change individuals' exercise experiences and behavioral patterns. Studies show that real-time data feedback provided by smart devices can enhance exercisers' self-efficacy and promote the formation of exercise habits; online fitness communities, through data sharing and

interactive check-ins, construct new types of social support networks.

At the level of governance innovation, some scholars propose the concept of "digital technology empowerment," arguing that digital technology can optimize the efficiency and precision of public sports service supply, promoting a shift from a government-led model to a multi-actor collaborative governance model. The development practices of smart sports communities demonstrate that digital platforms can achieve refined management of public services, enhancing community cohesion and social collaboration.At the frontier of international research, scholars are beginning to examine the phenomenon of sports digitalization from a broader perspective. Some studies suggest moving beyond examining the impact of single technological solutions on single stakeholders and instead focusing on how digitalization affects the entire sports ecosystem. Other studies introduce the "Sports Industry 5.0" framework, advocating for combining technological innovation with value goals such as humanism, sustainability, and social inclusion, preventing technological development from deviating from the path of social welfare.

2.3 Theoretical Resources on Paradigm Shift

The concept of "paradigm" was introduced by philosopher of science Thomas Kuhn to refer to the basic theoretical framework, value beliefs, and methodological system commonly accepted by a scientific community during a specific period. A paradigm shift implies that old ways of problem-solving are replaced by new ones, often accompanied by the redefinition of core concepts, innovation in research methods, and changes in worldview. This concept was later widely borrowed into the social sciences to analyze fundamental changes in social phenomena.

This paper adopts the concept of "paradigm shift" to emphasize that the transition from "national fitness" to "digital fitness" is not merely an update of technological means but involves a deep reconstruction of the conceptual foundations, practical forms, social relations, and even value orientations of sports participation. Specifically, this paper will analyze four dimensions—concept of exercise, mode of participation, logic of social interaction, and experience of time and space—to reveal the structural characteristics of this paradigm shift.

Simultaneously, this paper introduces theoretical resources from the sociology of technology and the sociology of the body. The sociology of technology focuses on the mutual influence between technology and society, emphasizing that technology is not merely a tool but also carries specific social logics and power relations. The sociology of the body views the body as a product of social construction, focusing on how the body is shaped, disciplined, and expressed by social forces. The combination of these two perspectives helps deepen understanding of how digital technology reconstructs people's perception of the body and shapes new forms of bodily practice.

3. From National Fitness to Digital Fitness: Four Dimensions of Paradigm Shift

3.1 Shift in the Concept of Exercise: From Means of Health Maintenance to Data-Driven Practice

In the traditional context of national fitness, exercise is primarily understood as a means of strengthening the body or a form of leisure and recreation, with its value directed towards physical health, functional maintenance, and quality of life improvement. This view treats exercise as "instrumental"—its value lies in its outcomes rather than the process itself. People exercise because it brings health benefits, delays aging, and prevents disease; the meaning of exercise is external to the exercise itself.

The rise of digital fitness drives a profound shift in this concept. Supported by technologies such as smart bracelets, sports apps, and wearable devices, exercise is redefined as a quantifiable, traceable, and optimizable data-driven practice. A series of indicators—heart rate, cadence, pace, calorie consumption, sleep quality, recovery time—constitute a digital mirror of the body, with every heartbeat and every step of the exercise transformed into data points for analysis. Individuals' perception of their bodies changes accordingly—the body is no longer merely a site of sensation but becomes an object that can be measured, compared, and optimized.

This shift has dual significance. On the one hand, datafication makes exercise more scientific and precise. Issues such as exercise intensity and recovery status, which were difficult to grasp through subjective feeling alone, can now be clearly understood through objective data. Individuals can adjust their exercise plans based

on data feedback, avoiding overtraining or undertraining, thereby enhancing exercise effectiveness and safety. On the other hand, datafication also alters the structure of meaning in exercise. When exercise is reduced to a series of numerical indicators, will the pleasure of movement, the sensory experience of the body, and the interactions with nature and others be overlooked in the cult of data? When individuals focus excessively on quantitative indicators like step counts and calorie consumption, will the intrinsic value of exercise be replaced by external performance metrics? These questions warrant consideration.

3.2 Reconstruction of Participation Mode: From Presence to Online Connectivity

Traditional sports participation is highly dependent on specific temporal and spatial conditions—fixed venues, unified schedules, and face-to-face interaction. Whether it's the morning exercise groups in community fitness spots, ball game enthusiasts in sports venues, or runners on park trails, their participation mode has a strong characteristic of "presence." Individuals need to arrive at a specific place at a specific time and be physically present with others to complete physical activities. Although this mode helps form community cohesion, it also imposes demands on participants' time, space, and social abilities.

Digital technology breaks this physical boundary, allowing people to access physical activities anytime, anywhere. The course libraries of sports apps provide 24/7 exercise options, allowing users to start exercising according to their own schedules; live-streamed fitness classes enable home-based exercisers to follow instructors in real-time, gaining an interactive experience close to being on-site; virtual event platforms allow runners in different cities to participate together and compete in real-time. These technological forms collectively construct a decentralized, flexible, and personalized mode of participation.

In this new mode, the role of individuals also undergoes profound changes. In the traditional mode, individuals are primarily consumers of sports services—purchasing venue services, participating in training courses, using fitness facilities. In the digital fitness framework, individuals are not only consumers of services but also producers and disseminators of exercise data. Every exercise generates data; data is collected, analyzed, and utilized by platforms, which in turn provide individuals with more precise service recommendations. Individuals' exercise behaviors become an important resource for the platform economy, with identity boundaries becoming blurred.

3.3 Evolution of Social Interaction Logic: From Geographically Based Communities to Interest-Based Tribes

Traditional sports communities are often based on geographical ties or shared interests. Participants in community fitness spots are often neighbors; members of workplace sports teams are often colleagues; enthusiasts in ball game clubs gather because of shared sporting preferences. The social interactions within such communities usually occur within the sports context—coordination and competition during the activity, communication and sharing afterward—with social interaction closely intertwined with sports.

Digital platforms have given rise to new types of "interest-based tribes." Members of these tribes may never have met face-to-face and may be thousands of miles apart, yet they establish close emotional connections through data sharing, online check-ins, virtual companionship in running, and interaction in comment sections. The "running group" feature in sports apps allows runners to see each other's tracks and achievements, giving likes and encouraging comments; audiences in fitness live-stream rooms interact in real-time through bullet comments, forming temporary communities; virtual medals and rankings in online events inspire a sense of belonging and honor among participants.

This evolution in social interaction logic is reflected in the transformation of mechanisms for community cohesion. The cohesion of traditional communities originates from "shared physical presence"—people interact face-to-face in physical space, establishing trust and identification through body language and emotional exchange. The cohesion of digital communities, however, shifts towards "shared focus"—members gather because of shared attention to the same sport, goal, or platform, maintaining connections through data flow and symbolic interaction. This transformation expands the temporal and spatial boundaries of social interaction, enabling more people to find like-minded companions across geographical

limits. However, it may also lead to the "lightweighting" of social relationships—can interaction at the data level truly replace genuine emotional connection? This is worth continued observation.

3.4 Reorganization of Temporal-Spatial Experience: From Singular Time-Space to Superposition of Virtual and Real

Traditional sports participation generally follows a linear temporal logic and fixed spatial boundaries. Exercise has a clear beginning and end, with the movement trajectory fading away upon completion; the sports scene has a specific physical location, and leaving that location means the end of the exercise experience.

Digital technology compresses the temporal and spatial distance in sports participation, making "simultaneous yet distant" a common phenomenon. Runners in different cities can start an online event at the same time, with exercise data synchronized and rankings updated in real-time; live-streamed fitness classes allow users to follow a coach thousands of miles away from home, with the spatial distance mediated by technology. Simultaneously, individuals' exercise trajectories are permanently preserved—each running route, each training session's data, each competition's record becomes part of a digital archive, available for playback, analysis, and sharing at any time. Sports participation thus takes on the characteristic of superimposing the virtual and the real: the physical experience of exercise and the digital record of data intertwine, with present movement sensations referencing past data.

This reorganization of temporal-spatial experience brings new possibilities for sports participation. Individuals can perceive their progress and changes by reviewing historical data, gaining motivation for sustained participation; they can compare trajectories and achievements with other runners, stimulating competition and collaboration; they can share exercise data on social platforms, gaining social recognition and support. However, permanently preserved data may also bring new pressures—every "poor performance" in exercise becomes a recorded "blemish"; anxiety over comparison with others may replace the pleasure of exercise itself. How to balance data recording with physical and mental experience has become an important issue for sports participation in the digital age.

4. Inherent Tensions and Critical Reflections on the Paradigm Shift

4.1 Digital Divide: Inequality in Technology Access

The rise of digital fitness is not a linear progression; behind it lie profound social tensions. Inequality in technology access is creating a new "digital divide," a concern that has received attention in existing research. Elderly groups, rural residents, low-income populations, those with lower education levels, and some people with disabilities are at a distinct disadvantage in terms of smart device ownership, network access, digital skills proficiency, and data comprehension capabilities, making it difficult for them to fully enjoy the benefits of digital sports.

From an infrastructure perspective, the digital divide between urban and rural areas and between regions remains significant. Urban areas have extensive 5G network coverage and high smart device penetration rates, allowing residents to conveniently access various digital sports services; rural areas have relatively weak network infrastructure, lower rates of smart device ownership and digital skills proficiency, presenting practical obstacles to the promotion of digital fitness. From a group perspective, the difficulties faced by the elderly in using digital technology are particularly prominent. Complex function settings, frequent version updates, and operational procedures requiring registration and login can all become barriers for the elderly in using sports apps. Even if they possess smart devices, they may lack the digital literacy to effectively utilize digital sports resources.

This digital divide not only limits sports participation opportunities for certain groups but may further widen existing health disparities. Those who can benefit from the digital sports dividend can access more scientific exercise guidance, richer exercise choices, and stronger motivation for physical activity, with their health potentially continuing to improve; those excluded from digital fitness may remain with traditional exercise methods or even reduce their participation due to technological barriers, with health disparities thus amplified by technology.

4.2 Data Commodification and Erosion of Autonomy

Another tension in digital fitness stems from

data commodification and the expansion of platform capital. The data generated by individuals during exercise—exercise trajectories, heart rate changes, calorie consumption, sleep quality, even location information—is collected, stored, and analyzed by platforms, becoming objects for optimization by commercial algorithms. Users' exercise behaviors are transformed into data commodities available for trade, and platforms use data analysis to achieve targeted marketing, personalized recommendations, and differential pricing strategies.

This process may lead to the erosion of individual autonomy in exercise. When platform algorithms continuously push exercise courses that users might be interested in, online events they might join, and smart devices they might purchase, do individuals' exercise choices originate from their own genuine intentions or from the subtle guidance of algorithms? When sports apps motivate users to continue participating through mechanisms like leaderboards, badges, and virtual rewards, does individuals' motivation for exercise come from the inherent pleasure of movement or from external performance stimuli? These questions touch upon the core dilemma of digital fitness: while technology assists individuals in exercising, it also rearranges the power relations around physical activity.

A deeper concern is that when the body is reduced to calculable data indicators, will those aspects of the exercise experience that cannot be quantified—the feeling of wind on the skin, the warmth of encouragement from companions, the joy of unexpectedly discovering a new running path—be overlooked in technological rationality? When individuals focus excessively on whether data targets are met, will their genuine bodily sensations be ignored or even suppressed? Will the richness and complexity of the exercise experience be reduced to a single performance metric in the cult of data?

4.3 Technological Alienation and the Loss of Humanistic Value

Reflection on technological alienation constitutes another important dimension of critique regarding digital fitness. Some studies point out that the development of smart sports communities should not be limited to infrastructure deployment but should pay attention to the potential risks of technological alienation and build inclusive digital governance strategies. The "Sports Industry 5.0" framework proposed by the international academic community also emphasizes that technological innovation should be coordinated with value goals such as human welfare, social equity, and ecological sustainability, preventing technological development from deviating from the path of humanistic concern.

One manifestation of technological alienation is "data dependence"—individuals rely excessively on data feedback to guide their exercise, losing trust in their own bodily sensations. When a sports app fails to record data due to a malfunction, some users even say they "don't know how to exercise anymore." Another manifestation is "algorithmic bias"—platforms' recommendation algorithms may solidify users' exercise preferences, restricting them to specific types of exercise and reducing their willingness and opportunities to explore new sports. When algorithms only push content that users "might like," the possibility for users to encounter new things is systematically reduced.

A deeper issue is whether the efficiency logic and performance logic advocated by digital fitness conflict with the humanistic spirit embedded in traditional sports. The value of sports lies not only in physical strengthening but also in cultivating willpower, promoting social interaction, and experiencing bodily freedom. When these values are reduced to calculable data indicators, when the meaning of exercise is replaced by performance metrics, is the spiritual core of sports gradually eroding?

5. Conclusion and Outlook

5.1 Research Conclusions

From the interdisciplinary perspective of the sociology of technology and the sociology of the body, this paper systematically analyzes the paradigm shift from "national fitness" to "digital fitness" and its underlying logic. The study draws the following main conclusions:

First, digital technology is profoundly reshaping the conceptual foundations and practical forms of sports participation. This reshaping is manifested across four interrelated dimensions: the concept of exercise shifts from "means of health maintenance" to "data-driven practice," with exercise redefined as a quantifiable and traceable data-driven activity; the mode of participation shifts from "presence" to "online

connectivity," with technology breaking physical boundaries and constructing decentralized, personalized modes of participation; the logic of social interaction shifts from "geographically based communities" to "interest-based tribes," with community cohesion shifting from "shared physical presence" to "shared focus"; the experience of time and space shifts from "singular time-space" to "superposition of virtual and real," with "simultaneous yet distant" becoming common and exercise trajectories permanently preserved.

Second, this paradigm shift is not a linear progression; behind it lie multiple tensions and challenges. Inequality in technology access is creating a new "digital divide," placing the elderly, rural residents, and low-income populations at risk of marginalization; data commodification and the expansion of platform capital may erode individual autonomy in exercise, reducing behavior to an object of algorithmic optimization; technological alienation may lead to issues such as data dependence and algorithmic bias, with the richness of the exercise experience facing the risk of simplification.

5.2 Theoretical Contributions and Practical Implications

At the theoretical level, this paper's contributions are as follows: First, it introduces the concept of "paradigm shift" into research on sports participation, revealing the structural characteristics of the transformation from national fitness to digital fitness and providing an analytical framework for understanding new forms of sports participation in the digital age. Second, it integrates theoretical resources from the sociology of technology and the sociology of the body, deepening understanding of the interactive relationship between digital technology and bodily practice. Third, it offers a critical reflection on the tensions and challenges behind the paradigm shift, responding to discussions in international academia concerning the relationship between technology and humanism within the "Sports Industry 5.0" framework.

At the practical level, this paper offers the following implications for promoting the healthy development of digital fitness:

First, accelerate the construction of universally accessible digital infrastructure, promote the age-friendly and accessibility-friendly adaptation of sports apps, lower the threshold for technology use, and ensure that different groups can access digital sports services. The digital divide between urban and rural areas and between regions needs to be gradually eliminated through policy support and resource allocation.

Second, strengthen digital literacy education for the entire population, enhancing the data comprehension and application capabilities of the elderly, rural residents, and those with lower education levels, enabling them to truly benefit from digital technology. Digital skills training should be incorporated into the content systems of community education and education for the elderly.

Third, improve data governance mechanisms, clarify the boundaries and usage norms for platform data collection, and safeguard individuals' data sovereignty and privacy security. Relevant laws and regulations need to be refined to address the particularities of exercise and health data.

Fourth, integrate humanistic considerations into technological design from the outset, ensuring that digital technology truly serves people's exercise experience rather than replacing it. The essence of sports ultimately lies in human bodily practice; technology should expand, rather than compress, the possibilities of this practice.

5.3 Research Limitations and Future Directions

This study is primarily based on theoretical analysis and literature review, lacking systematic empirical data support, and its revelation of the specific mechanisms and impact effects of the paradigm shift requires further deepening. Future research can be expanded in the following directions: first, conduct large-scale empirical surveys to quantitatively analyze the characteristics and health effects of digital sports participation among different populations; second, use qualitative research methods to deeply understand individuals' genuine experiences and meaning construction in digital fitness practice; third, conduct comparative studies to explore the similarities and differences in digital sports development across different countries and regions, as well as their influencing factors; fourth, focus on the potential for integrating digital technology with traditional sports values, exploring how to preserve the humanistic spirit of sports amid technological

innovation.

The transition from “national fitness” to “digital fitness” is both an inevitable trend of technological development and a profound reflection of social change. Only by maintaining necessary tension between instrumental rationality and value rationality, and seeking dynamic balance between technological innovation and social inclusion, can this transition truly become a positive force for promoting public health and enhancing social well-being.

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