

# Analysis of Hot Spots and Trends of Sports Digitization Research in China Based on CiteSpace

Zining Shi, Mao He\*

*School of Physical Education and Health, Nanning Normal University, Nanning, Guangxi, China*

*\*Corresponding Author.*

**Abstract:** To further understand the research hotspots and trends in the field of digital sports in China in the past decade, the China National Knowledge Infrastructure (CNKI) database was used as the sample source, and the CiteSpace software was used to obtain the knowledge graph of the annual number of published papers, authors and research institutions, keyword clustering, and emergence, to explore the development process of sports digitalization in China. **Conclusions:** (1) In recent years, the number of publications related to sports digitalization in China has shown a wave-like upward trend, and it will increase rapidly from 2020 to 2023. (2) There is no close connection between the authors of papers in this field, and most of the research institutions are sports and normal colleges, which lack cooperation and lack of collaboration in interdisciplinary fields. (3) According to the keyword analysis, the current research hotspots in China include digitalization, the sports industry, the digital economy, digital sports, physical education, and sports consumption. (4) Keeping up with the pace of building a digital China is an inevitable requirement for building a sports power. The deep integration of sports and digitalization is a new driving force for building sports power and promoting the sustainable and high-quality development of sports.

**Keywords:** Sports Digitalization; CiteSpace; Hot Spots; Development Trends

## 1. Introduction

With the accelerated integration of global industrialization and informatization in the 21st century, the digital transformation of the sports field is an inevitable requirement to promote the development of sports. The Outline for Building a Sports Power,

promulgated in 2019, emphasizes accelerating the innovative application of digital technologies such as big data, cloud computing, and artificial intelligence in the field of sports, and improving sports service capabilities. Digitalization is an important symbol of social modernization, and it will inevitably affect the future direction of sports modernization. Wu [1] pointed out that as a product of the digital transformation and development of sports, digital sports is an important engine for accelerating the construction of sports power and expanding the new path of modern sports in the digital era, which has attracted extensive attention and in-depth exploration from all walks of life. In-depth understanding of the research hotspots and development trends of sports digitalization, providing new ideas and references for future scientific research, and promoting the development of sports digitalization. This paper visually analyzes the research on sports digitalization and puts forward relevant suggestions for the development of sports digitalization.

## 2. Data Selection and Methodology

The literature data used in this paper comes from the China Knowledge Network database. In the advanced search of the CNKI database, the topic of "sports digitization" was selected, 312 pieces of related literature were retrieved from 2012 to 2023, and 297 pieces of literature were retained after the screening. In this paper, use the CiteSpace 6.2.R4 visualization software to take the relevant literature on sports digitization included in the China Knowledge Network Database (CNKI) as the research object, and we mainly analyze the annual volume of publications, the mapping analysis of the authors of the publications and the research institutes, the keyword co-occurrence and the clustering analysis, etc., to decipher the basic research status of the

digitization of sports.

### 3. Results and Analysis

#### 3.1 Analysis of Annual Volume of Publications

The trend of the number of published papers can reflect the research level and development trend of a certain field. Using the CiteSpace analysis, the annual number of publications related to the digitalization of sports can be derived from 2012 to 2023 and plotted as a trend graph (Figure 1). It can be seen from the publication trend chart that the research results on sports digitalization in academia have shown an overall upward trend in the past decade. During the period from 2012 to 2018, the number of publications on sports digitalization increased in waves. Compared with 2018, the number of publications in 2019 has increased suddenly, because society should promote the application of emerging technologies such as intelligent manufacturing, big data, and artificial intelligence in the field of sports manufacturing, encourage sports

enterprises, universities, and scientific research institutes to jointly create sporting goods R&D and manufacturing centers, vigorously develop "Internet + sports", and stimulate the development of the sports economy. From 2021 to 2023, there has been a significant increase in the number of articles related to the digitalization of sports. With the growing popularity of artificial intelligence and AI, the sports field is gradually moving towards digital transformation. For example, the digital transformation of sports can improve the management level and efficiency of the sports industry. Sports digital resources are convenient and spatiotemporal; The convergence of sports technology and digital technology can improve the level and quality of training. With the continuous development of digital technology, the academic community has paid more attention to the research in the field of digital sports, and the relevant research results have increased significantly compared with previous years, which shows that sports digitalization has become a hot topic in the field of sports.

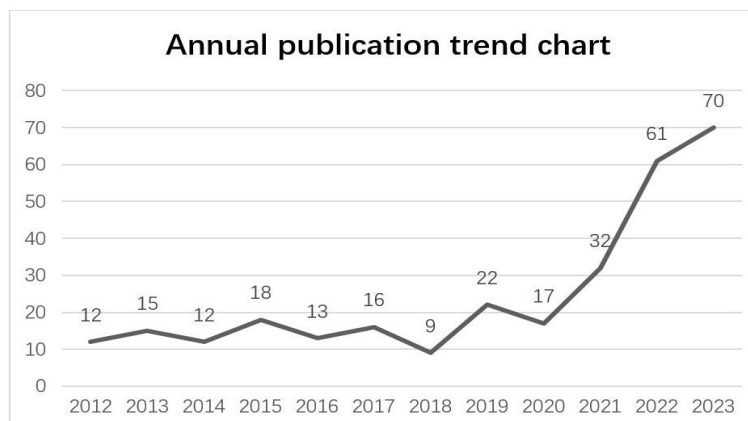


Figure 1. The Trend of the Annual Number of Sports Digitalization Research

#### 3.2 Analysis of Authors

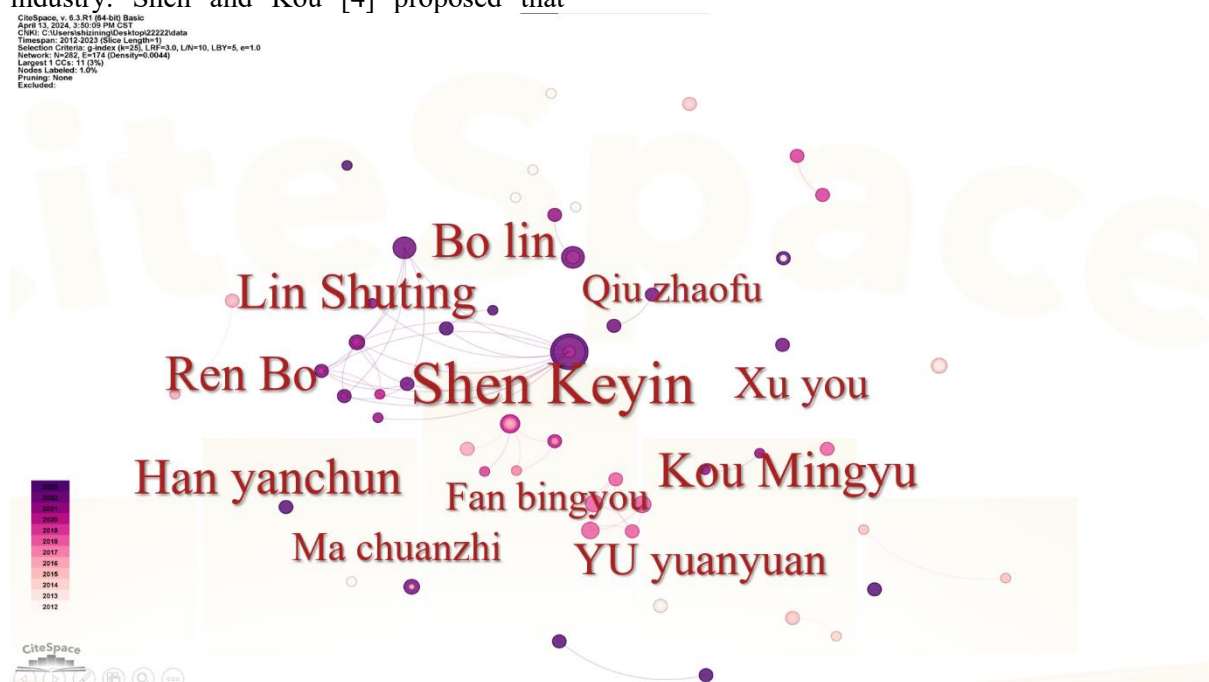
Author co-occurrence analysis shows the academic collaboration between authors, which is a visual picture generated by selecting analytical units, setting appropriate thresholds, and excluding individual outliers. The size of the node represents the number of papers published by the author, and the distance between the nodes and the thickness of the link indicates the level of collaboration between the authors[2]. Using CiteSpace visual analysis software, the authors were analyzed to obtain a knowledge graph of authors with 273 nodes, 167 connections, and

a network density of 0.0045 (Figure 2).

It can be seen from the knowledge graph of the author of the article that the core author is represented by Shen Keyin of the Wuhan University of Physical Education, followed by Lin Shuting, Ren Bo, Berlin, Kou Mingyu, etc. It shows that there is little closeness and a lack of cooperation among scholars. Among them, Shen Keyin has published 14 papers and is the core author of this research field. Shen Keyin is from the Sports Social Science Research Center of Wuhan University of Physical Education, a scholar who continues to focus on the digital transformation of the sports industry and has formed a close cooperative

relationship with scholars such as Lin Shuting and Kou Mingyu. Shen Keyin proposed that only by promoting the deep integration of the digital economy and the sports industry can we promote the digital transformation of the sports industry in an all-around way and help build a sports power. Shen and Lin [3] proposed that promoting the digital transformation of the sporting goods manufacturing industry is an important measure to help build a new development pattern of "dual circulation" and promote the high-quality development of the sports industry. Shen and Kou [4] proposed that

actively developing the digital economy and promoting the digital development of the sports industry have become the only choices to cope with future development trends. Berlin [5] believes that digital technology should be used to strengthen the improvement of the teaching system of higher education and physical education. Ren [6] proposed the current difficulties faced by the digital economy and the sports industry, and the implementation path to promote the high-quality development of the sports industry.



**Figure 2. Knowledge Map of Authors of Published Articles**

### 3.3 Analysis of Research Institutions

The knowledge graph of the publishing institution was analyzed by CiteSpace software (Figure 3). In terms of journal publishing institutions, Wuhan University of Physical Education has the largest contribution to the publication of articles, followed by Shanghai University of Sport and the School of Sports Science of Fujian Normal University. It can be seen from the knowledge graph of the issuing institutions that sports colleges and normal schools have made a greater contribution to the research related to sports digitalization, and other universities and research institutions also have a certain amount of publications, but the research institutions are not concentrated enough, and

the cooperation between institutions is less. Based on the analysis of the published literature on high-yield institutions, it is found that the main research of the Wuhan University of Sport focuses on the development status and coping strategies of the digital transformation of the sports industry. Shanghai University of Sport and Fujian Normal University also focus on the digital transformation of the sports industry, but Fujian Normal University also has research on the combination of digital technology and digital technology to empower sports governance. Jishou University focuses on the inheritance and development of sports' intangible cultural heritage resources through digital technology.



**Figure 3. Knowledge Mapping of Research Organizations**

### 3.4 Keyword Co-occurrence Analysis

The keyword co-occurrence knowledge graph (Figure 4) obtained by CiteSpace analysis has 264 nodes, 407 connections, and a network density of 0.0117. From the figure, it can be intuitively seen that keywords such as digitalization, sports industry, digital economy, and physical education appear more frequently. In addition, in the research centered on "sports digitalization", there are also many research hotspots such as archives management, sports teaching materials, and talent training. Based on the research literature corresponding to the keyword nodes, the research hotspots of sports digitalization are closely related to digital empowerment, the sports industry, sports management, sports resources, etc. Shen et al. [7] proposed that to help the transformation of the sports industry, it is necessary to deeply integrate with the digital economy. Zheng et al. [8] believe that with the progress of society, the application of digital technology to the field of sports intangible cultural heritage will create more possibilities for the inheritance and protection of sports intangible cultural heritage. Chen [9] proposed that digital technology brings more development space to the traditional physical education teaching model, makes up for the limitations and shortcomings of time and space, and brings more freedom to the educated in physical education learning. You

[10] proposed that in the digital era, accelerating the integration and development of sports academic journals and new media is an inevitable trend to activate the vitality of sports academic journals. The reintegration of sports journals and digital media is conducive to the high-quality development of sports journals and better play the role of serving sports academics. Zhang [11]. proposed that in the digital era, promoting the innovative application of digital technology in the field of sports and promoting digital governance of sports are the only ways to lead the reform of sports governance and realize the modernization of sports governance.

### 3.5 Keyword Emergence Analysis

Frontier hotspot research has changed in different periods, and it can be divided into three stages. The first stage is 2012-2016: the high-frequency keywords in this stage are "network", "stadiums" and "sports management". In the era of network information, digital technology is used to effectively use sports resources, such as uploading information to stadiums synchronously to facilitate people to selectively carry out sports activities; The intangible cultural heritage of sports shall be digitally managed to protect and disseminate excellent traditional sports culture. The second stage is from 2016 to 2019: the high-frequency keywords in this stage are "physical culture", "physical education", "physical education

curriculum" and "physical education". With the rapid development of "Internet + education", subject teaching will become more diversified. The combination of physical education and digital teaching helps students to feel and understand more intuitively, which can enhance students' interest and improve teaching results. The convenience of digital resources breaks the limitations of time and space. The third stage is from 2020 to 2023: the high-frequency emerging words in this stage are "digital technology", "sports

industry" and "digital economy". Based on the great changes in the scientific and technological revolution and industrial transformation, if the sports industry wants to develop with high quality, it must follow the pace of social digital construction. promote the daily life and facilitation of sports for all; Promote the standardization and scientific nation of competitive sports, and promote the digitalization and ecology of the sports industry.



Figure 4. Keyword Co-occurrence Knowledge Graph

## 4. Conclusion and Perspectives for Future Studies

### 4.1 Conclusion

Based on the analysis of the number of published papers related to sports digitalization, it can be seen that the academic community has not explored enough research on sports digitalization. However, since 2021, the number of published papers has increased rapidly, and in the context of scientific and technological revolution and technological change, the national policy orientation has made the academic community pay more attention to the digitalization of sports, and the integration of the digital field in the field of sports has generated strong vitality, which is conducive to the sustainable development of sports research. From the perspective of the authors and research institutions, the core

authors of the relevant studies are mainly represented by Shen Keyin, but the authors are relatively independent and not close enough. The research institutions are mainly sports colleges and normal colleges, and the research institutions are scattered and have less cooperation. The cultivation of sports talents lacks interdisciplinary elements, and the integration of scientific and technological development and sports is not grasped enough. From the perspective of keyword co-occurrence and clustering, the research hotspots of sports digitalization mainly focus on five high-frequency keywords: digitalization, the sports industry, digital economy, digital sports, and physical education. With the development of science and technology and digital transformation, the research on sports digitalization in recent years mainly focuses on three aspects: physical education, the sports industry, and the deep

integration of sports and digitalization.

#### 4.2 Perspectives for Future Studies

To build sports power in an all-around way, it is necessary to explore new impetus and promote the high-quality development of sports. Based on the current research trend of sports digitalization, this paper puts forward suggestions for the development of sports digitalization from four aspects: public sports, competitive sports, sports industry, and sports government affairs:

(1) From the aspect of public sports: the combination of digital technology and sports can improve the facility configuration of stadiums, give people more scientific sports guidance, transparency of information about various events, and more efficient and synchronous physical fitness monitoring. There are still many problems in public sports and fitness facilities, such as old infrastructure, inadequate management mode, imperfect functional types, and other problems. Through digital technologies such as venue information transparency and online reservation services, the problem of information asynchronous in public fitness venues and facilities is solved, and the effective use of stadium resources is promoted. The integration of scientific fitness resources online provides effective guidance and consultation for the public, drives the public's participation in sports, and makes people fall in love with scientific sports; Use big data, artificial intelligence, and other digital technologies to realize data monitoring and analysis of national physique.

(2) From the aspect of competitive sports: in competitive training, intelligent equipment is used to accurately locate the load, plan, evaluate, and adjustment of athletes to improve the quality of training; Through the real-time synchronization of athlete data, a more personalized training plan can be created to improve the decision-making level of coaches; Adopt more intelligent and accurate game capture technology to make the game more fair, just and transparent; Digital technology ensures the clothing, food, housing and transportation of various types of events, and fully gives the participants a sense of experience.

(3) From the perspective of the sports industry: under the guidance of the digital revolution, the digital economy plays an important role in

promoting the transformation of the sports industry and improving the efficiency of production factors. Promote the precision and intelligence of services in the sporting goods manufacturing industry, so that consumer groups can get a better experience; Promote the integration of sports competition performance industry and tourism and other related industries to drive economic development; Realize online physical education training and teaching, and improve the efficiency of cloud resource utilization; Enrich the combination of Internet and sports products, such as e-sports, live sports, etc., and broaden the consumer model.

(4) From the aspect of sports government affairs: the traditional sports office platform is not coordinated enough and the efficiency is not high. The sports government cloud platform built by digital technology realizes the collaboration of data and business processing and partitions business information to ensure business process, transparency, and efficiency.

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