# Cover Letter

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The Spatial and Temporal Evolution and Spatial Correlation Pattern of the Integration and Development of the Digital Economy and Sports Industry in China

Dear Editor:

Thank you very much for your and the reviewers' comments on our manuscript (sustainability-2031066). The comments have provided excellent suggestions and helped us to improve the manuscript. We have revised this manuscript and update the abstract, introduction, literature, conclusion, added the contribution, structure of the work, limitations and future research. Because the above changes, the former title "The Spatial and Temporal Evolution and Spatial Correlation Pattern of the Integration and Development of the Digital Economy and Sports Industry in China" has been changed into "The Coupling Coordination Degree and Spatial Correlation Analysis of the Digital Economy and Sports Industry in China" in the revised manuscript. The changes in the manuscript have been highlighted in red font.

Please find attached a revised version of our manuscript. Our point-by-point responses to your comments are listed below. If you have any questions about this paper, please let me know.

We are looking forward to receiving your final decision.
Best wishes
Ya-wei Wang

# Response to Reviewer 4 Comments

**Point:** Emphasize and highlight their main contribution, explain the results based on the literature; and convince the reader about the value added to their results.

**Response:** We are extremely grateful that the reviewer pointed out this problem. According to your suggestions, we have consulted a large number of literatures, revised the introduction extensively in terms of content, and added the literature review part. Through reviewing the achievements related to the topic from 2018 to 2022, we have identified the contributions of other authors to the research and the existing literature gaps. In order to highlight the value of the paper and let other authors know about the paper, we have added the contribution part. As we have revised the introduction, we have also recommend extensive changes.(see introduction, page 2, line 30-52, page 3, line 1-5, page 4., line 1-18),(see recommendations page21,line 37-48,page 22, line 1-50)

As following:

In recent years, scholars have shown great interest in the relationship between the digital economy and the sports industry. On the theoretical level, a large number of scholars have carried out relevant research, based on the connotation of digital economy and combined with the "push-pull theory", YE et al studied and elaborated the driving mechanism of the development of sports industry driven by digital economy [7]. Ren et al. believes that the sports industry gives play to economies of scale, economies of scope and the long tail effect through factor digitalization, process digitalization and product digitalization, forming the internal mechanism of the integration of digital economy and sports industry [8].Dong et al constructed the mechanism of the big data digital economy driving the high-quality development of the sports industry from the micro, meso and macro levels, and showed through simulation experiments that the digital economy could endow the sports industry with high-quality development power, improve the industrial production efficiency, and contribute to the quality reform, efficiency reform and power reform of the sports industry [9].At the same time, the digital economy is gradually being applied and infiltrated into different aspects of the sports industry,unmeng Chen, Li Haijie, CAI Jianhui, Luo Yuxin and Liu Chao respectively analyzed the dynamic mechanism, value dimension and strategic measures of digital economy in creative sports industry, sports leisure characteristic town, sports goods manufacturing industry, sports competition performance industry, ice and snow sports industry and other fields [10-14]. Shen Keyin et al. further refined the research content and program, and took the 5G technology-enabled live ice hockey game of Beijing Sports Media, the block chain-enabled "Sports Time Bank" of Bluebird Sports, and the Internet-enabled Zhejiang Huanglong Sports Center as examples to analyze the scene samples of the digitalization of sports service industry and make a study and decision on the development trend [15]. Pan Wei, Wei Yuan and Chai Wangjun respectively analyzed the current development predicament and optimization path from the perspectives of digital economy enabling

high-quality sports industry, driving the upgrading of sports industry structure and boosting the digitalization of sports industry [16-18].(see page 2, line 30-52, page3, line1-6)

Existing literature has proved that digital economy can significantly improve the development of sports industry, but digital economy and sports industry are complex systems, without accurate objects and appropriate indicators, it is difficult to quantitatively analyze the relationship between them. In order to solve this problem, a large number of scholars have carried out relevant research. Considering the potential relationship between digital economy and energy transition, Muhammad Shahbaz et al. studied the impact of digital economy on renewable energy consumption and power generation structure, as well as the heterogeneity between digital economy and energy transition [19]. Li Linhan et al. estimated the level of China's digital economy from the perspectives of grey correlation, coupled coordination and spatial correlation network [20]. Li Xiangyang and Han Zhaoan constructed the index system between digital economy and high-quality development from different dimensions [21-22]. Liu Jun et al. analyzed the driving factors of digital economy based on SAR model [23]. Yang Song et al. used the coupling coordination degree model to measure the coupling coordination degree of Chinese sports industry and electronic information industry [24]. Wang Yuzhen et al. conducted an empirical analysis of the coupling coordination relationship between the development of China's sports industry and tourism industry, and sorted the explanatory power of influencing factors of coordinated development from the greatest to the smallest through OLS regression model [25]. Yao Songbo et al. made an empirical analysis of the influence of sports industry agglomeration on regional economic growth by using static and dynamic panel models, and measured the level of sports industry agglomeration in various provinces and cities with the industrial proportion index [26]. Xu Jinfu et al. studied the development of sports industry and tourism industry from the perspective of industrial integration [27].(see page 3, line 7-30)

The above research results provide good experience for further deepening the research on the coupling development of digital economy and sports industry, but there is still room for further expansion. First, the existing research results mainly focus on the power, process, path and effect of the coupling of "digital economy and sports industry" from a qualitative level. Most of the literature analyzes specific cases. Describe the case phenomenon and analyze the existing problems, and put forward the countermeasures and suggestions to promote the coupling development of the two; Second, the research focuses on the one-way impact of digital economy on the high-quality development of sports industry, and the two systems interact with each other, so it is necessary to analyze the two-way relationship between them from the perspective of coupling and coordinated development. Third, the index system of the development of digital economy and sports industry exists independently, and the coupling development system between digital economy and sports industry has not been built, and there are few results of systematic quantitative research on the degree of coupling coordination between the two and the spatial distribution characteristics of this relationship.(see page 3 line31-45)

Based on this, the main contribution of this study is reflected in the following two aspects: First, it constructs the evaluation index system of the coupling development of the integrated development of digital economy and sports industry by using the coupling coordination theory, and empirically

tests the coupling development level and dynamic evolution of the two in China based on the statistical data from 2015 to 2019, expanding the quantitative research on the integration development of the two. Second, the spatial correlation analysis method is adopted to analyze the spatio-temporal evolution characteristics of the integrated development of China's digital economy and sports industry, and the correlation and spatial agglomeration effect of the integrated development of digital economy and sports industry in 30 provinces, autonomous regions and municipalities in China (except Xizang and Hong Kong, Macao and Taiwan, hereinafter referred to as the provinces) are analyzed from the spatial perspective. In order to provide theoretical and practical reference for other countries (regions) in the world to quantitatively evaluate the complex coupling relationship between digital economy and sports industry. It provides quantitative decision-making reference for relevant departments in China and provinces to clearly position the integration stage, identify the two-way force between digital economy and sports industry, optimize the digital transformation strategy of sports industry, and improve the driving force of digital economy.(see page 3 line46-51, page 4 line1-13)

The rest of this article is organized as follows. The second part introduces the data source, index system structure and research methods. In section 3, the dynamic coupling relationship with time is studied. The fourth section further discusses the spatial correlation pattern of integrated development. Finally, Section V draws conclusions and recommendations.(see page 4 line14-18)

As following:

First, establish regional coordinated development mechanism to promote the balanced development of digital economy and sports industry. The research results show that the comprehensive development level of digital economy and sports industry is not balanced. The government should improve the top-level design, give targeted policy preference, financial support and technical guidance to different regions, and speed up the construction of digital economy and sports industry infrastructure according to local conditions. From the perspective of digital economy, the development priorities and division of labor and coordination mechanisms of high-level, medium and low-level regions are clarified. The experience and successful model of digital economy innovation and development pilot zones will be promoted nationwide. Continue to strengthen and give full play to the advantages of the development of digital economy, make use of the achievements of the construction of digital economy, promote the digital transformation and in-depth development of the sports industry. At the sports industry level, we will implement the "Sports aid to Tibet" and other policies to promote the development of the regional sports industry in the western and central regions, and seize the "advantages of the northwest" to develop ice and snow sports, so that the regions that develop first will drive the regions that develop later, and form a positive pattern of interactive development of the sports industries in the eastern, central and western regions.

Second, define the stage of regional integration and deepen the coupling and coordinated development. The eastern region should continue to maintain its development momentum, deepen the new business forms that integrate the digital economy with the sports industry, innovate the forms of services and products, and enhance the contribution of the sports industry to the development of the digital economy. At the same time, on the basis of ensuring its own development, it should actively transfer talents, technology and experience to the outside, break the restrictions of administrative divisions, reduce industry barriers, and undertake the important task of driving the integrated development of China's digital economy and sports industry [1]. The western region

should, based on its own resource endowment and industrial structure characteristics, highlight regional characteristics, and improve the application level of digital sports from the field of low difficulty and low cost. The central region should give full play to its geographical advantages of connecting the east with the west and connecting the south with the north. Taking the "Opinions on Promoting High-quality Development of the Central Region in the New Era" as an opportunity, the central region should accelerate the application of digital, networked and intelligent technologies in the field of sports, promote inter-provincial cooperation and coordinated development of border areas, and create a carrier for the coupling development of digital economy and sports industry. We will further expand the space for their coupled and coordinated development.

Third, attach importance to the positive spatial correlation function of coupling development and optimize the spatial pattern of coupling development. Combined with the advantages of each province in economy, resources, location and industrial structure, the coupled and differentiated layout was carried out to enhance the coupled and coordinated high-quality development capability of the province itself. We will encourage neighboring provinces to develop comprehensive plans for coupled development, and promote a new pattern of coordinated development among provinces. The "H-H" type in the eastern region should, on the premise of maintaining a good development momentum, attach importance to innovative development and explore new business forms, new models and new paths of coupled development. The "L-L" type in the western region can take Sichuan Province as the central city of the coupling and coordination of the two, and drive the improvement of the technical level, management mode, thinking concept and value concept of the surrounding areas with the growth pole effect [1]. The central region belongs to the type of "H-L" and "L-H". It should seek for the focus of coupling development from its comparative advantages of huge market potential, profound cultural deposits and rich resource factors, and promote the cooperation between the six inter-provincial border regions in the central region and the eastern border regions in terms of talents, technology, market and industrial chain, and enhance the internal force of coupling development in the process of cooperation.(see recommendations page21,line 37-48,page 22, line 1-50)