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ORIGINAL

RESEARCH ON SPORTS DEVELOPMENT FROM THE PERSPECTIVE OF ECOLOGICAL ENVIRONMENT

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ABSTRACT

It holds that the ecological world is an organic whole with internal relations, and that man, nature and society are a dynamic and harmonious unity, and advocates the establishment of a new relationship between man, nature and society. The construction of ecological sports park can not only meet the public's rigid demand for fitness places, promote the orderly progress of national fitness, but also promote the development of ecological sports. Therefore, this paper makes an empirical analysis on the ecosystem efficiency of leisure sports industry by measuring the green total factor productivity. In this paper, the coupling coordination degree model is used to measure the coordination level of sports elements subsystem and ecological environment subsystem. The results show that: from the analysis of coupling trend, the coupling coordination between sports and ecological environment elements in the leisure sports industry in the eastern, central and western regions of China is generally on the rise from 2010 to 2021. The simulation results of the system are consistent with the historical results. The relative error of the simulation results of the main factors of the system is basically controlled within 10%, and the average error is less than 5%. It shows that the optimization strategies of sports development should include constructing modern leisure sports industry system and protecting natural resources. Strengthen the overall coordination of industries and promote the rational allocation of resources.

KEYWORDS: Ecological environment; Sports; Coupling coordination; Leisure sports industry

1. INTRODUCTION

Sports is a special cultural phenomenon, which exists in the whole cultural environment and belongs to a subculture. The development of sports affects the urban environment, which in turn restricts the operation and development of sports. The research on sports ecological environment has been developed for at least 20 years in China, and many topics in the new era are constantly derived from nature, society, humanities and life. In the change of market demand brought about by the rapid economic development, the role of sports, tourism and other life services in expanding effective investment and consumption has become increasingly prominent, and has become an important field for cultivating medium-and long-term economic growth points and developing new impetus (Zheng, 2018). Niche is the possibility of a species living in it, which is determined by the variation and adaptability of the species. The actual niche needs to consider biological factors and their interaction, and it is a real niche in nature (Giulianotti, 2021). The remarkable improvement of people's living standard, the aging of population and the acceleration of new urbanization, the economic and social benefits of sports industry gradually appear. The health status of college students is related to their future development, the smooth growth and success of individuals, and the future and hope of the nation. With the all-round advancement of quality education, the physical education in colleges and universities has made remarkable achievements. As a complete system, the further development of sports shows that competitive sports can not only inspire people's patriotic enthusiasm, but also win honor for the country after winning the gold medal, that is, win glory for the country; China's economic growth continues to develop from extensive to intensive, which requires the transformation of economic growth mode by improving the level of scientific and technological development, the quality of workers and the innovation of management (Yu, 2020); Under this background, the role of sports schools should also be changed accordingly.

The original sports schools, which only cultivate competitive sports talents, are also facing the dilemma of their own development under the condition of equal emphasis on competitive sports and national sports. Therefore, how to solve the imbalance between the development level and the development opportunity of leisure sports industry ecosystem has become an urgent problem in the theoretical and industrial circles (Van Cauwenberg et al., 2018). If we can grasp the laws and dynamic mechanisms in the current industrial evolution process from a dynamic perspective and make use of them, it will help the leisure sports industry ecosystem to develop in a healthy and optimized direction. Eco-sports is the relationship or connection constructed by the mutual coordination, mutual care, symbiosis and common development of sports, culture and ecological environment. Eco-sports embody a spirit of human sports. In the construction of sports ecological culture in colleges and universities, we should give priority to the development of cultural inheritance

and innovation and sports individuality liberation, pay attention to the development of characteristic campus sports ecological culture, strengthen the construction of sports behavior culture and sports material culture, and realize the integration of national spirit and the spirit of the times (Lindsey, 2008). This paper measures and evaluates the efficiency of leisure sports industry ecosystem, extracts the key factors that affect the efficiency, and puts forward the path to improve the efficiency of leisure sports industry ecosystem, which is conducive to the all-round improvement of leisure sports industry ecosystem in China, and also helps the government, enterprises and other relevant stakeholders to put forward improvement measures (Agyingi, Wiandt, & Ngwa, 2017).

2. Related Work

2.1 Research on Sports Service Industry

As its main industry, has gradually become a new economic growth point, and it is also an important force to help build a strong sports country. Van et al. think that the sports service industry is a collection of various service departments that take the value and essential functions of the sports industry as resources and mainly provide sports service products. Ahn et al. analyzed the phenomenon of low-level balanced development of sports service industry from the perspective of institutional economics, that is, the supply and demand of the industry is always at a low level of balanced development, but eventually bad money will drive out good money, which will further shrink the market (Ahn & Chon, 2018). Yang pointed out that the key point of industrial coupling lies in the active enterprises among industries (J. Yang, 2020). With the continuous development of industries, enterprises in industries break through industrial boundaries driven by interests, and introduce and apply elements and resources of critical industries, so as to enrich their own industrial activities, meet the diverse needs of consumers, guide consumer behavior and carry out industrial restructuring. Chappel al. think that leisure sports industry is the product of the times of the progressive development of sports industry and tourism industry (Chappel, Aisbett, Considine, & Ridgers, 2021). It has the characteristics and advantages of both sports industry and tourism industry, is more flexible and richer, breaks the industrial restrictions and forms a new integrated industry. Strain et al. analyzed from the angle of industrial chain, constructed and interpreted the elements of the internal industrial chain of leisure sports industry in detail, and provided new ideas and methods for the structural optimization and layout promotion of leisure sports industry (Strain et al., 2020; White, Schaefer, Thompson, Kribs, & Gaff, 2019).

2.2 Research on Leisure Industry Ecosystem

As the research object of industrial ecology, industrial ecosystem is the

research hotspot of ecology, economics, environmental science, systems engineering and other disciplines, aiming at solving the relationship between industry and environment, and forming a healthy and harmonious industrial development model with reference to natural ecosystem (Campeau & Hazari, 2018). Rokade et al. think that industrial ecosystem is a high-order core to promote the development of economic ecosystem, which is dynamic and develops with the evolution of social and economic forms (Rokade, Barker, & Guiry, 2019).

Wang et al. used grey analytic hierarchy process to evaluate the comprehensive efficiency of urban complex industrial ecosystem from three aspects: industrial economy, society and ecological environment (Wang & Zeng, 2020). Yang (Y. Yang, 2020) put forward the theory of three-level evolution of industrial ecosystem, which is from infinite resources to infinite waste, from limited resources to limited waste, and closed circulation system. He believes that an ideal industrial ecosystem includes four kinds of actors: resource exploiters, manufacturers, consumers and processors. Li et al. constructed an ecological model of cultural and creative industries by analyzing the various elements of the ecological system of cultural and creative industries and the relationship between them and the environment, and further analyzed the operating mechanism of cultural and creative industries on this basis (Li & Ju, 2020).

3. Research Method

3.1 Evaluation of Ecosystem Efficiency of Leisure Sports Industry

Ecology refers to the specific geographical space, location, topography, geomorphology, climate and other conditions that directly affect human life. The environment determines the project, content and scale of developing sports. The destruction of the biological environment has affected the development of all human activities. To protect our biological environment, we should try our best to keep harmony with the natural environment in the operation and development of sports, not only give full play to people's subjective initiative, but also follow the laws of nature. While developing the sports industry, merchants realize that people's needs are increasingly developing towards the psychology of seeking knowledge, seeking pleasure, seeking activity, seeking health and seeking novelty, and gradually returning to nature. The demand for sports is not only physical activities, but also demands for the sports environment, such as comfort, nature, spacious and bright. It holds that the ecological world is an organic whole with internal relations, and that man, nature and society are a dynamic and harmonious unity, and advocates the establishment of a new relationship between man, nature and society. Therefore, the implementation effect of China's ecological sports policy largely depends on the state of students' attitude towards sports learning. The

ecological view of physical education curriculum essentially emphasizes the organic unity of nature, society and people in the physical education curriculum system, making nature, society and people the basic sources of physical education curriculum (Meyer, Keller, Wolfersdorf, & Lee, 2018; Y. Yang, 2020). However, due to the influence of the sports environment, the restriction of the actual sports system and the prejudice of the society on sports, there is a big gap between the actual niche and the basic niche of ecological sports, which further affects the physical education curriculum and the actual niche of the sports population, and hinders the realization of the basic niche of sports goals. As the main body of human ecological sports, sports are the core of ecological sports (including the ways and means of sports), and environment is the condition of ecological sports. The three are mutually harmonious, symbiotic, harmonious and cooperative. Eco-sports tourism is based on the concept of sports tourism, and on the premise of ecological balance, it seeks tourism resources that can create economic benefits in combination with the ecological environment. The construction of ecological sports park can not only meet the public's rigid demand for fitness places, promote the orderly progress of national fitness, but also promote the development of ecological sports.

Therefore, this paper makes an empirical analysis on the ecosystem efficiency of leisure sports industry by measuring the green total factor productivity. The sports element subsystem and the ecological environment subsystem cover a wide range. Considering the actual situation, it is impossible to apply all the indicators to the evaluation process. Therefore, according to the principle of subjectivity, the representative evaluation indicators that can reflect the development of the two element subsystems to a certain extent are selected in the selection of indicators, so that the selected indicators can highlight the key points (Li & Ju, 2020). The selection of evaluation indicators is an objective reflection and embodiment of the efficiency of leisure sports industry ecosystem. From many indicators related to research objectives, the indicators that can best reflect the leisure sports industry ecosystem and represent its efficiency are selected. Therefore, the selection of indicators should be able to compare the same province in different years, or different provinces in the same period. This requires the comparability of indicators, that is, the statistical caliber and evaluation method of the same indicator in different decision-making units and different years should be consistent, so as to ensure the feasibility of horizontal analysis and vertical analysis (Carrey, Rodríguez-Escales, Soler, & Otero, 2018; Fang et al., 2019). In essence, sports industry belongs to the category of tertiary industry service industry. Therefore, this paper synthesizes the existing research of scholars, combines the connotation definition and research needs mentioned above, and follows the principles of scientificity, comparability and operability to construct the input-output index system as shown in Figure 1 below:

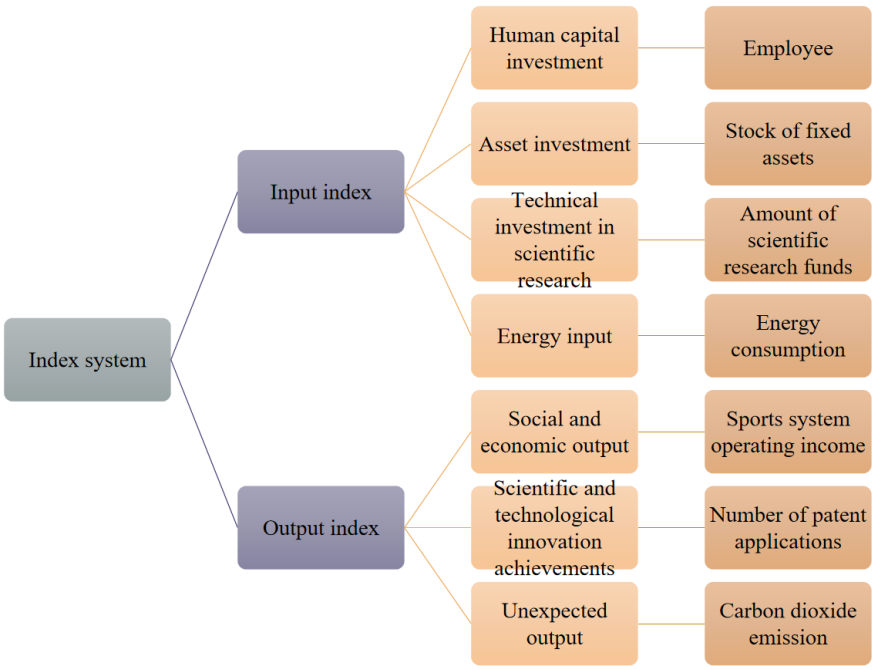

Figure 1: Input-output index system of leisure sports industry ecosystem efficiency

This paper adopts the perpetual inventory method used by most scholars and refers to the calculation formula of capital stock to estimate the fixed capital stock in various regions of China's leisure sports industry.

$$K_t = I_t + (1 - \partial_t) * K \quad (1)$$

Where t represents the year, K represents the capital stock, I represents the investment, and ∂ represents the depreciation rate. Industrial demand elasticity refers to the ratio of the increase rate of demand for drilling in an industry to the increase rate of per capita national income, and its calculation formula is:

$$E = \frac{\Delta Q/Q}{\Delta I/I} \quad (2)$$

In the calculation process formula of demand elasticity of leisure sports industry, $\Delta Q/Q$ refers to the change rate of sports tourism demand; $\Delta I/I$ the change rate of sports tourism income. The larger the income elasticity of demand of leisure sports industry is, it shows that the increase of sports tourism products can bring more income and create more demand. The faster the industrial development, the greater the contribution to the national economic growth. Calculate the weight W_i of the primary index (or secondary index), and the formula is as follows:

$$W_i = \frac{S_i}{T} \quad (3)$$

S_i is the sum of the expert scores of each first-level index (or second-level index); T Sum of expert scores of all first-level indicators (or second-level indicators). According to the above-mentioned "1-10" subjective evaluation method, the weight coefficient of leisure sports industry ecosystem efficiency is obtained.

3.2 Calculation of Coupling Coordination Degree of Internal Elements of Leisure Sports Industry Ecosystem

An ideal industrial ecosystem should have the symbiotic characteristics of natural ecosystems, that is, it can realize the sustainability of development. System structure is the organizational form of various elements in the system. With the sports service industry as the core, the value systems of all products and services jointly frame the boundary of the sports service ecosystem, and with the industrial chain as the link, the contents directly related to the value creation, value increment, value transmission and value regeneration of sports services are included in the system. Industrial environment can be divided into industrial internal environment and industrial external environment, including supporting industrial and natural, social and economic environment, which embodies the ecological process of material circulation. The proportion of the number of people in sports tourism is increasing year by year, and the scale of sports tourism is large, which can promote the economic growth. More people participate in sports tourism projects in first-tier cities, which makes some regions under-developed and some regions over-developed, thus forming a sharp contrast.

The professionalism of tourism requires the supervision and management of professional organizations, otherwise, it will only make the industrial development more blind and random, and the sustainable development will inevitably be implicated and cannot be realized with a high probability, which leads to many problems that need to be solved. In addition, problems such as single structure and aging form are gradually exposed. Coupled with the gradual improvement of foreign tourists' travel requirements, these deficiencies and defects have reached the point where they must be solved in order to meet the travel needs of more people. In order to realize the sustainable development of the coupling system, a fair and scientific benefit distribution mechanism must be established, so as to guarantee the development of the coupling system. and play a positive role in prospering sports market players and exerting the positive economic benefits of sports industry. The industrial environment and the external environment together constitute the industrial ecological environment of the sports service industry ecosystem, which is an important foundation for the survival and development of the sports service industry, and provides conditions for the feedback and return of the demand of the industrial internal system. Figure 2 shows the internal ecological environment of sports service industry.

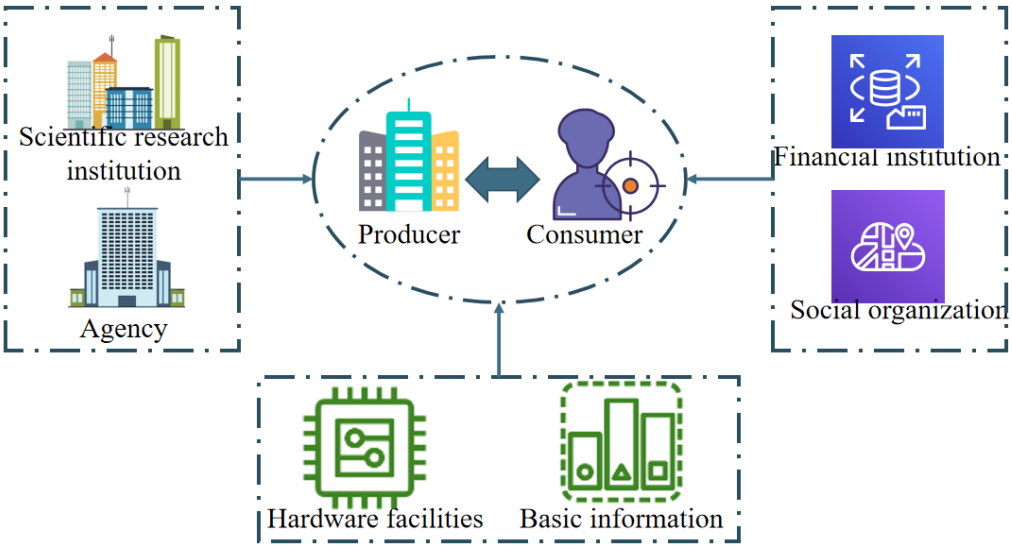

Figure 2: Internal ecological environment of sports service industry

The production activities of sports services are inseparable from venues and facilities, and even more from sports fitness equipment. At the same time, transportation, catering and accommodation, medical and health care, commodity retailing and other industries also indirectly affect the development of sports service activities. The application of digital media and Internet technology is quietly changing the production mode, consumption form and communication mode of sports service industry. With the help of creative expression, it can better stimulate consumer demand and share the development results. All kinds of sports-related social organizations effectively restrict and guide the development of sports service industry through the promulgation of industry rules and standards, thus ensuring the legitimate rights and interests of industrial subjects, smoothing the fast track of industrial integration and jointly promoting the standardization of industrial development. Scientific and technological progress has brought about the innovation of business model, the improvement of production efficiency and added value, and accelerated the transformation and upgrading of traditional sports service industry, which determine the development trend and height of sports service industry. However, the internal system elements need to constantly adapt to and explore the changing rules of the external environment, and make corresponding adjustments through the sending and receiving of resource information. The internal circulation, the external circulation and the internal and external circulation together constitute the sports service industry ecosystem, and promote the overall evolution of the system. In this paper, the coupling coordination degree model is used to measure the coordination level of sports elements subsystem and ecological environment subsystem, and the function expression is expressed by $f(x), g(y)$. The coordination of system realization refers to the relative deviation coefficient of $f(x), g(y)$, that is, the smaller c, the better. Its expression is as follows:

$$C = n\left[\frac{(u_1 u_2,\cdots,u_n)}{\prod(u_i+u_j)}\right]^{\frac{1}{n}} \quad (3)$$

$$u = \sum_{i=1}^{m} \lambda_{ij} \cdot u_{ij} \quad (4)$$

$$\sum_{j=1}^{m} \lambda_{ij} = 1 \quad (5)$$

Where u is the comprehensive order parameter of the system. Because the value of correlation coefficient is relatively large and the amount of information is too scattered, which is not conducive to horizontal and vertical comparison. By calculating the correlation degree between sports industry and urbanization, it is easy to analyze the correlation between sports industry and urbanization. The formula is as follows:

$$\gamma_{ij} = \frac{1}{k}\sum_{i=1}^{k} \xi_i(j)(t) \quad (6)$$

Where, k is the number of samples, which can be used to obtain the time-series variation law between indicators or the spatial relationship between indicators by cross-sectional data samples. Tobit model, as a typical representative of the limiting or intercepting model, is the most effective for parameter estimation of restricted dependent variables. If the general regression model is adopted, the parameter estimation will be biased and inconsistent. The random effect model of Tobit panel data is constructed as follows:

$$GTFP_{it} = \beta_0 + \beta_1 \cdot x_{it} + \varepsilon_{it} \quad (7)$$

$GTFP$ (green total factor productivity) is the explained variable, x is the explained variable, β_0 is the constant term of the regression equation,β_i represents the estimated coefficient of each explained variable, t is the year, and $\boldsymbol{\varepsilon}$ is the random error vector. Grey prediction model is a model theory that uses the known fuzziness to predict the unknown. It can predict the future fuzzy trend according to the past or existing variable data. Most grey prediction models use GM (1,1) model for prediction and analysis, and can make long-term prediction. For industrial development, forecasting is very beneficial. It can be analyzed according to the forecasting results, so as to know in advance, plan in advance and deploy scientifically, and take targeted measures to improve the industry's ability to resist risks. The original data are ordered, while the new data are complementary. For example, in the common sales volume forecast, the sales volume of each day or month is more or less different. If the target value of the annual sales volume is planned, if the monthly sales volume is accumulated, the annual sales volume will show some regularity.

A derivative model $GM(1,1,x^{(1)})$ model can be derived from the $GM(1,1,D)$ model:

$$x^{(0)}(k) + az^{(1)}(k) = b \quad (8)$$

$$x^{(0)}(k) = \beta - ax^{(1)}(k-1),\ k = 2,3,\cdots,n \quad (9)$$

$$\alpha = \frac{a}{1+0.5a} \quad (10)$$

$$\beta = \frac{b}{1+0.5a} \quad (11)$$

4. Analysis and Discussion of Results

Scientific and effective understanding of the development of China's sports service industry, the following principles are followed in the process of selecting and collecting the data of specific influencing factors: representativeness, substitutability, scientificity and feasibility. Combined with the theoretical model of sports service ecosystem constructed in the previous article and the development status and problems of China's sports service industry, on the one hand, it is necessary to ensure that the source of index data is regular and effective, and at the same time, it is necessary to give consideration to the availability and computability of index data, so as to select easy-to-quantify and more standardized indicators to ensure that the development status can be well measured. In this paper, 31 provinces, municipalities and autonomous regions in China are selected as research units, and the data of relevant indicators of tourism factor system are from China Tourism Statistical Yearbook from 2010 to 2021. The relevant index data of sports element system comes from China Sports Yearbook and China Sports Statistical Yearbook from 2010 to 2021. Some data from China Statistical Yearbook, statistical yearbooks of various provinces and statistical bulletins of national economic and social development, and the missing index data of individual years are calculated and completed by trend extrapolation and interpolation. According to the coupling coordination degree model, calculate the weight values of each index, and get the weight values of each index of leisure sports industry system in three regions, such as Table 1:

Table 1(a): Weight of each index of leisure sports industry system by region

INDEX	EASTERN	MIDDLE	WESTERN
HUMAN CAPITAL INVESTMENT	0.1242	0.0514	0.1825
ASSET INVESTMENT	0.169	0.1403	0.0483
TECHNICAL INVESTMENT IN SCIENTIFIC RESEARCH	0.1297	0.1354	0.0577

Table 1(b): Weight of each index of leisure sports industry system by region

INDEX	EASTERN	MIDDLE	WESTERN
ENERGY INPUT	0.1101	0.0655	0.0596
SOCIAL AND ECONOMIC OUTPUT	0.043	0.149	0.1965
SCIENTIFIC AND TECHNOLOGICAL INNOVATION ACHIEVEMENTS	0.1072	0.0267	0.0812
UNEXPECTED OUTPUT	0.0794	0.1814	0.1732

Table 2 is the rotated composition matrix. The variables in the table are arranged according to the load, from which it is easy to judge which variable should be classified into which factor, thus making the representative significance of the new factor more vivid.

Table 2: Rotated composition matrix

INDEX	COMPONENT PART	
	1	2
HUMAN CAPITAL INVESTMENT	0.3039	-0.3224
ASSET INVESTMENT	0.6579	0.9659
TECHNICAL INVESTMENT IN SCIENTIFIC RESEARCH	0.4686	0.6555
ENERGY INPUT	0.2515	0.6843
SOCIAL AND ECONOMIC OUTPUT	0.7487	0.7064
SCIENTIFIC AND TECHNOLOGICAL INNOVATION ACHIEVEMENTS	0.6008	0.2543
UNEXPECTED OUTPUT	-0.2269	-0.1524
HUMAN CAPITAL INVESTMENT	0.7302	0.0836
ASSET INVESTMENT	0.7417	0.7662
TECHNICAL INVESTMENT IN SCIENTIFIC RESEARCH	0.3962	0.0741

Asset investment(0.9659), Social and economic output(0.7064) and Asset investment(0.7662) have higher load on the second principal component factor and are dominated by it, among which Asset investment has the highest load level, It represents the expenses of sports service industry for R&D and innovation within enterprises, while Social and economic output can better explain consumers' recognition and acceptance of sports service products and services (Liang et al., 2019; Yue, Liu, Li, & Lu, 2019). It reflects the ability of self-growth and collaborative development within the industry, that is, it is closely related to the internal system operation driven by the supply and demand mechanism, so it is decided to name this new factor as internal collaborative innovation (Zhao et al., 2022). After analyzing and sorting out the data of various provinces and cities respectively and making relevant calculations, the coupling and coordination trend and situation of sports and ecological environment subsystems in the leisure sports industry system in the three major regions of China's eastern, central and western regions are obtained, as shown in Figure 3:

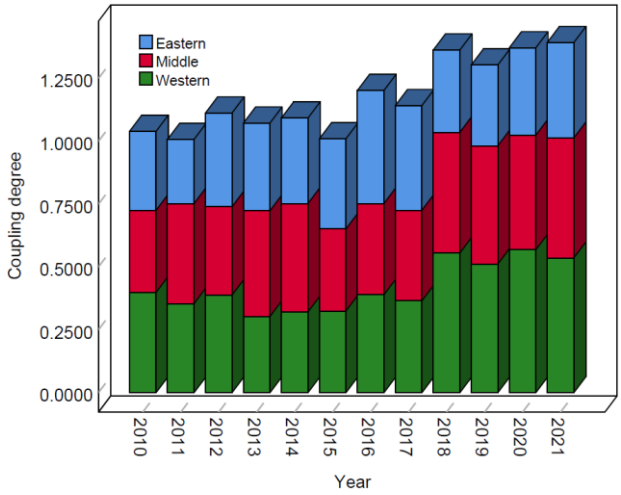

Figure 3: Coupling and coordination trend of internal factors in leisure sports industry system

From the analysis of the coupling trend, it can be seen that the coupling coordination of leisure sports industry in the eastern, central and western regions of China is generally on the rise from 2010 to 2021, especially in the central region. Except for 2014, the coupling coordination degree in other years is increasing year by year. Compared with the central and western regions, the eastern region has the most prominent indicators such as industrial scale and enterprise income. In 2011-2017, it was on the verge of maladjustment; From 2018 to 2020, the coupling coordination degree is high, reaching the state of barely coordination and primary coordination respectively, and the coupling degree is slightly better than that of the eastern and central regions. Based on the basic data of China's sports industry system and ecological environment system. According to the formula, the standardized values of each index of China's sports industry system (as shown in Figure 4) and China's eco-environmental system (as shown in Figure 5) are obtained, which provides the basis for the following analysis of the correlation and coupling between China's sports industry system and eco-environmental system.

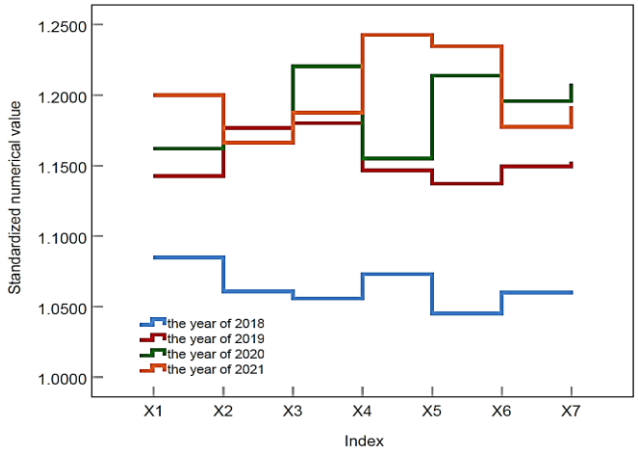

Figure 4: 2018-2021 Standardized values of various indicators of China's sports industry system

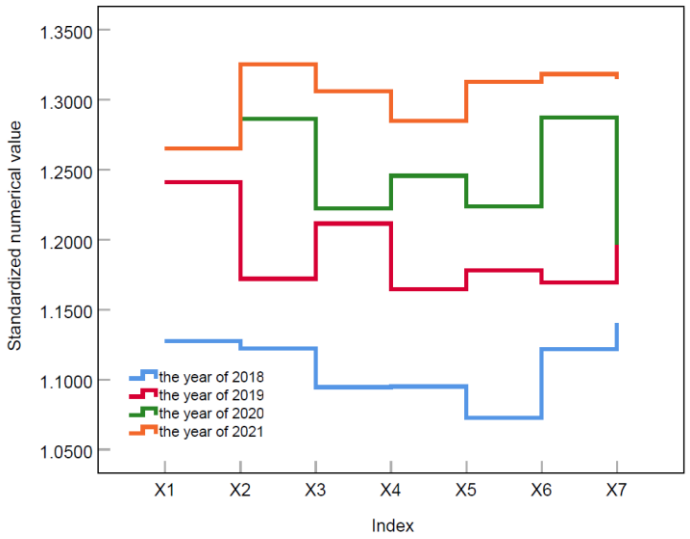

Figure 5: 2018-2021 Standardized values of indicators of China's ecological environment system

Figure 6 shows the correlation between China's ecological environment system and the subsystems of sports industry from 2018 to 2021. From the vertical perspective, from 2018 to 2021, the ecological environment system and the subsystems of the sports industry are in a state of moderate correlation and coupling. Among them, Correlation coupling degree 1~4 respectively indicates the coupling degree between sports industry scale and urbanization, the coupling degree between sports industry contribution and urbanization, the coupling degree between sports industry structure and urbanization and the coupling degree between sports market players and urbanization.

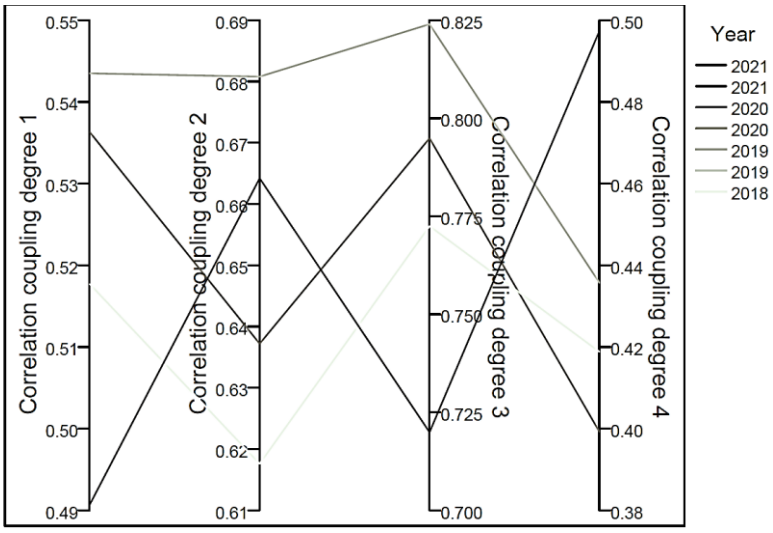

Figure 6: Correlation degree between China's ecological environment system and sports industry subsystems from 2018 to 2021

In 2020, the eco-environment system and the sports industry structure will be in a strong coupling state, and the eco-environment system will be in a

strong coupling state with the sports industry scale, sports industry contribution, sports industry foundation and sports market players. Stability test means that the established model is in a stable structure as a whole, and the slight change of any internal factor will not have obvious influence on the overall trend of the system. History test is to further test whether the model can truly simulate the actual situation by comparing the simulated value obtained by running the model with the actual data. In this paper, the GM (1,1) grey prediction model is used, and the test time range is from 2010 to 2021. Based on the importance of indicators and the availability of data, the output value variables of leisure sports industry in this model are selected for historical data test. As shown in Figure 7 below.

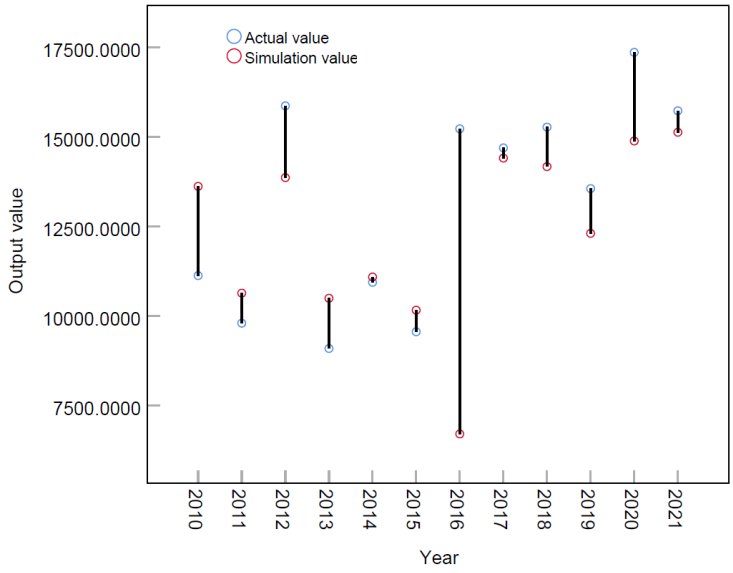

Figure 7: Comparison between actual data and simulation data of leisure sports industry output value (unit: 100 million yuan)

The simulation results of the system are consistent with the historical results. The relative error of the simulation results of the main factors of the system is basically controlled within 10%, and the average error is less than 5%. It can be said that the model has passed the historical test, and the simulated values have good fitting degree with the actual values of variables. It is necessary to strengthen the construction and innovation of the top-level system, and it is also necessary for all the main bodies and elements in the system to cooperate with each other to improve quality and increase efficiency. The government and relevant departments should make clear the direction of future industrial structure adjustment according to the differentiated content of industrial structure, and establish an industrial chain coordinated development mechanism with the main industry as the center and the main industry and derivative industries promoting each other with the help of objective and dynamic feasibility analysis. Environment is closely related to human beings. It is the sum total of various natural forces or functions that affect human life and

production activities, including not only the combination of various natural elements, but also the sum total of various ecological relationships formed between human beings and natural elements. The core of humanistic development view is the full affirmation and respect of human value and dignity. The primary problem of sports development is to solve the relationship between human beings and sports. People-oriented sports, highlighting people's personality, is a platform for people to show themselves. The concept of sustainable development of sports is that while developing sports, we should not only pay attention to the positive and healthy development of sports' own functions and values, but also solve the mutually beneficial coexistence and harmonious development of human-nature-society-sports, that is, the comprehensive sustainable development of sports benefits, social benefits and ecological benefits. China's leisure sports industry ecosystem can achieve environment-friendly development, that is, reduce environmental pollution, reduce resource energy consumption and effectively improve system efficiency. Therefore, China should give full play to the advantages of ecological environment and take concrete measures. Encourage the development of energy-saving and environment-friendly technologies, improve resource utilization rate, reduce pollutant emissions and energy consumption by means of technical means, and at the same time, strengthen the effective communication between leisure sports industry and universities and scientific research institutions to improve the conversion rate of scientific research achievements. Strengthen publicity and education to improve the environmental awareness of enterprise managers and consumers.

5. Conclusion

Eco-sports is the relationship or connection constructed by the mutual coordination, mutual care, symbiosis and common development of sports, culture and ecological environment. Eco-sports embody a spirit of human sports. Sports service industry, as its main industry, has gradually become a new economic growth point, and it is also an important force to help build a strong sports country. From the analysis of the coupling trend, it can be seen that the coupling coordination between sports and ecological environment elements in the leisure sports industry in the eastern, central and western regions of China is generally on the rise from 2010 to 2021. Horizontally, from 2018 to 2021, the correlation between the ecological environment system and the subsystems of the sports industry also showed a trend of first increasing and then decreasing. From the vertical perspective, from 2018 to 2021, the ecological environment system and the subsystems of the sports industry are in a state of moderate correlation and coupling. The simulation results of the system are consistent with the historical results. The relative error of the simulation results of the main factors of the system is basically controlled within 10%, and the average error is less than 5%. The model has passed the historical test, and the simulated values have good fitting degree with the actual values of variables.

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