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Significance of the Analysis of the Weight Impact of Urban Sports Services Based on Fuzzy Evaluation

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ABSTRACT

Regarding sports facilities, we have considered factors such as quantity, type, quality, and availability. Regarding sports activities, we focus on factors such as the frequency, scale, level, and participation of events. Regarding sports training, we have considered factors such as the type, frequency, quality, and effectiveness of training. Regarding sports guidance, we focus on factors such as professionalism, timeliness, effectiveness, and personalization of guidance. Based on the fuzzy evaluation, this article analyzes the factors influencing weight in urban sports services. Firstly, we have constructed an evaluation system for urban sports services, including sports facilities, sports activities, sports training, sports guidance, and other aspects. Then, we used the fuzzy mathematics method to evaluate each aspect's weights.

Keywords: International Sports Center City, Fuzzy Comprehensive Evaluation, Evaluation Index Construction, Weight Calculation

1. Introduction

After the perfect curtain call of the Beijing Olympic Games and the Eleventh National Games, our country's competitive sports development is becoming stronger and stronger. In the middle of the 80s of last century, the sports association of the street community in our country was produced, marking the beginning of the development of public sports in our country. After decades of continuous progress and development, public sports have become essential to China's mass sports work and sports life. In the past thirty years of reform and opening up, China's economy and the construction of urban culture have achieved unprecedented development, and the quality of life of urban residents has been dramatically improved. With the continuous development and expansion of urban public sports services, the city's demand for health is rising, and the concept of fitness is also spreading among the people. Therefore, China's public sports services have achieved better development. In line with the principle of "being convenient to the people and benefiting the people", the city governments have also built public sports service facilities so that the general public can easily participate in the sports industry. However, in practice,

it is found that the public sports service system in our country has yet to be established, and the public sports service network formed could be better. Moreover, there are many problems, for example, how to make the government's investment in public sports more reasonable, how to make full use of the resources of public sports services, and how to judge the development of public sports in a city to make the development of public sports keep pace with the times. It is essential and positive to establish a public sports service evaluation system for the international sports center city [1].

2. State of the Art

As for sports public service, Xiao Linpeng believes that public service should be defined in public administration rather than the theory of public goods. He also deduced the definition of public sports service according to the concept of public service [2]. From the point of view of service, He Jian and others think that public sports service refers to the sports products and sports services provided by the public sports organizations and the public sports service personnel for public sports activities [3]. Zhang Qiong and Ni Ming have investigated and studied the current situation of community sports public service in Shanghai and have found that the existing types of community sports facilities are single, the layout is not reasonable, the intensity of maintenance and management is not enough, and the community sports funds are insufficient; the forms of community sports organizations are scattered, the development of management and service lags, and there is a lack of professional fitness instructors, and the quantity and quality of community public sports products and services are still not high [4].In retrieving and collating foreign-related research results, no literature explicitly puts forward the concept of community sports as public service. Western developed countries have attached great importance to sports public services and have set the focus and foundation of services on the community so that convenient, flexible and multi-purpose community sports centers have become the primary carrier of sports public service. The construction of community sports centers is the primary measure of carrying out sports public service in Western developed countries [5]. In general, similar research abroad focuses on creating contemporary Western sports policy and the impact of public administration and public management theory on sports public management.

3. Methodology

3.1 Construction Process of Evaluation Index

In this paper, according to the relevant connotations and characteristics of the international sports center city, the evaluation index was constructed based on experts' relevant experience and methods. Then, further screening and analysis were carried out using the Delphi method. Finally, the International Sports Centre City Evaluation Index, which can meet the requirements and standards, was constructed. The construction process of the evaluation index of the international sports center city is shown in Figure 1 [6].

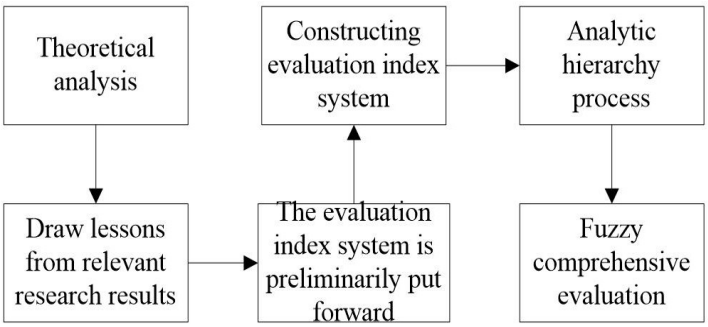

Figure 1. International Sports Center City evaluation index system construction workflow chart

3.2. Index Selection of Evaluation Index System

The comprehensive evaluation system of city sports services in international sports centres is complex and has multiple factors. According to the research results and inspiration of relevant literature, it is considered that the construction of a comprehensive evaluation system for sports services in the international sports center city should involve not only the main content of the sports sector but also sports-related peripheral content to reflect the characteristics of the times in cities affected by sports. Therefore, in this paper, based on the theory of sports subject and the theory of operation, the development of sports service in the city is further classified, and the relevant evaluation indexes were selected and screened [7].

In the construction and development of sports services, content suitable for the current city and having solid characteristics of the times should be chosen in light of the specific circumstances of the international city and its economic development. Therefore, in evaluating the development of sports services in international sports centre cities, the city's sports-related indicators, such as global level, humanistic sports, and green sports, should be considered. The basic process of specific index screening is shown in Figure 2 [8].

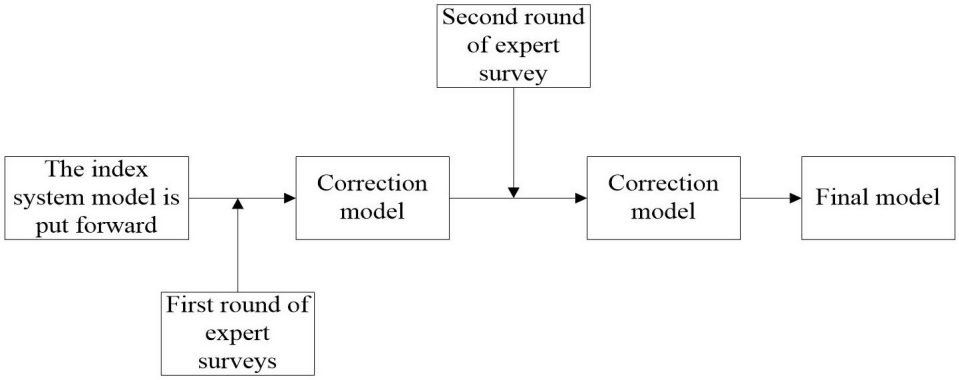

Figure 2. Specific process of evaluation index selection

3.3. Determination of Weights of Evaluation Indexes of International Sports Center Cities

After screening the evaluation indexes of the international sports center city, it is necessary to understand the importance of each index to evaluate the international sports center city. The relevant evaluation indicators selected and finalized above are all composed of different forms and more dispersed indexes. In the city of International Sports Center, the effects of the indexes on the evaluation results are different. Therefore, it is necessary to determine the weight of the evaluation index of the international sports center city. In this section, the weights of each evaluation index were further calculated. The weight value will directly affect the evaluation result of the international sports centre city, and the calculation result will lead to changes in urban evaluation results. Therefore, it is important to calculate the weights of the relevant evaluation indexes [9].

There are many methods to determine the weights of relevant evaluation indexes. The common weight calculation methods are sorted, and it is found that the weight calculation process can be divided into two categories. One is the subjective weighting method. In the subjective weighting method, the assessor analyzes the weight of each index and finally gives the subjective evaluation, in which the evaluation results are more in line with the actual situation. However, due to the subjective solid awareness in the assessment process, the weight analysis results given by different evaluators to the same index are different. So, there is also a deviation from the calculated weight values. The other method refers to the objective weighting method. In the objective weighting method, each index's variance, numerical value and relevant information are calculated to obtain the weight coefficients of each index. The weights of the indexes calculated by the objective weighting method can avoid the subjective factors to a maximum extent, and this method is also a relatively acceptable method to determine the weights of relevant indexes in the scientific community. However, the method is only concerned

with calculating the coefficient of variation, so the concrete conditions of the calculated object can't be considered more comprehensively. In this paper, it is necessary to determine the weight index of the evaluation index of the public sports service in the international sports center city. Therefore, the impact of the city's specific circumstances on the weight is very huge. Therefore, the analytic hierarchy process was adopted to analyze the weight of the evaluation index of the international sports center city. The specific analysis process is as follows [10].

First, the relevant hierarchical structure model should be established, and the specific situation of the city and related issues should be analyzed. Then, various factors that influence the evaluation of indexes are decomposed and arranged according to their attributes. In factors of different levels, the factors of evaluation indicators only affect the upper and lower factors after decomposition. Secondly, the matrixes of each layer should be judged by the factors after decomposition. The judgment matrix comprises the horizontal contrast result of the importance of the decomposition factor of the same level of evaluation index. After setting up the evaluation hierarchy model of the public sports service index in the international sports center city, based on literature and relevant experts' research results and experience, the influence factors of index decomposition are contrasted, and the relevant judgment matrixes are constructed according to the hierarchy. The stagger analysis method used in this paper is a scale of 1-9 [11]. This method is more in line with people's thinking habits and judgment habits in the traditional sense. Each class and its corresponding scale are shown in Table 1.

Scaling	Meaning
1	Two factors, compared with the same importance
3	Compared to the two factors, the former is slightly more important than the latter
5	Compared to the two factors, the former is more important than the latter
7	Compared to the two factors, the former is more important than the latter
9	Compared to the two factors, the former is more important than the latter
2,4,6,8	Represents the intermediate value of the adjacent judgment above

Table 1. The 1-9 scale method used in judging the elements of a matrix

The steps of checking consistency in matrix judgment are: firstly, the consistency index CI is calculated, and then the corresponding random consistency index RI is searched by the related calculation results. The formula for calculating the consistency evaluation index CI is as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{1}$$

$\lambda_{\max}$ refers to the eigenvector of the largest eigenvalue of the matrix judgment process, and n is the 1-9 evaluation scale mentioned above. After calculation, the value of RI is calculated by N, which is equal to different evaluation scales, and the result is shown in Table 2.

m	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.91	1.12	1.23	1.30	1.44	1.45

Table 2. Mean random consistency index of positive reciprocal matrices

After calculating the correlation index of the average random consistency of the reciprocal matrix, the consistency ratio should be calculated again. The method for calculating the consistency ratio CR is CR=CI/RI. When the consistency ratio CR is less than 0.1, the consistency of the reciprocal matrix can be judged to be credible in this model; if the consistency ratio is greater than 0.1, then the matrix model should be revised and further calculated [12].

4. Result Analysis and Discussion

4.1. Fuzzy Comprehensive Evaluation Method

L.A. Zadeh put forward the idea of fuzzy comprehensive evaluation in 1965. The core idea of the evaluation idea is that when evaluating a fuzzy set, it is necessary first to determine which elements in the fuzzy set belong to it and which judgment elements do not. To define the relevant elements of the plan, all relevant judgment elements within the scope of the definition should be assigned. According to the size of the assignment, whether the relevant judgment elements to be judged belong to the judgment set to a large extent can be determined. Therefore, the core idea of the fuzzy comprehensive evaluation method is to quantify the same nonlinear evaluation factors by using fuzzy operations in fuzzy mathematics to judge the evaluation result by quantifying the result [13].

Therefore, based on the concept of the fuzzy comprehensive judgment model, in evaluating the public sports service in the international sports centre city, the evaluation indexes for the evaluation standards of public sports service in international sports centre cities were decomposed. After the decomposition, according to the fuzzy comprehensive evaluation method, the evaluation index of each level was assigned and rated. Then, through the fuzzy comprehensive evaluation, the influence of various factors on the evaluation index was judged. Thus, the general assessment of the public sports service degree of the international sports center city was carried out [14]. The process of fuzzy comprehensive evaluation is shown in Figure 3.

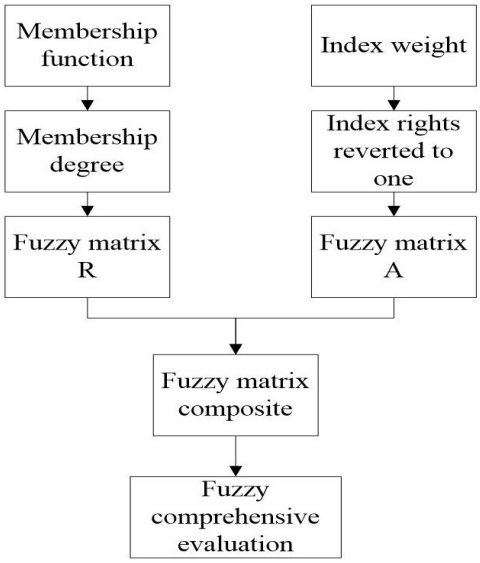

Figure 3. Fuzzy comprehensive evaluation system process

4.2. Concrete Application of Fuzzy Comprehensive Evaluation System

To verify the reliability and authenticity of the evaluation system of the public sports service in the international sports center city based on the fuzzy comprehensive evaluation system proposed in this paper, due to various restrictions, the case study of Vanke District in Huanggu District of Shenyang was carried out. The Vanke District, 5 km from the city centre of Shenyang, covers an area of 230 thousand square meters. The total construction area is about 400 thousand square meters, and most interior buildings have low and middle floors. By visiting the relevant leaders of the Vanke district and the owners living in the residential area, the views of 153 people on the public sports service in Shenyang were obtained, graded and used as research validation data [15].

The influence of the method of fuzzy comprehensive evaluation on the evaluation results of

public sports service in international sports center city was investigated. In this paper, the improvement of urban sports facilities and urban public sports service quality were taken as the observation variables. Data was collected in the form of questionnaires. The characteristics of the sample were as follows: (1) the job distribution of the respondents and (2) the distribution of the industry.

Position type	Number of people	Proportion (%)
Chairman or CEO	8	5%
Vice president or VP	23	15%
Multi department director	29	19%
Division Manager	35	23%
Executive director	38	25%
General staff	20	13%

Table 3. Profiles of Interviewees

Among the respondents, there were 60 senior leaders, accounting for 39% of the total number of people surveyed, and 73 middle-level leaders, accounting for 48% of the total number of people surveyed; and senior leadership accounted for 87% of the total number of people surveyed. Most respondents were the higher position staff in the enterprise, mastering the development of the surrounding public sports service and being able to answer the questionnaire objectively.

In the above, the literature was examined, expert advice was sought, the evaluation indexes and decomposition factors of the public sports service in Shenyang were determined, and the index system of public sports service in the international sports center city was established. The results of the public sports service index and the related weights of the international sports center city are shown in Table 4.

B1Sports service (0.1466)	C11Goals of urban sports activities (0.0504) C12Participation of residents in sports activities (0.0466) C13The development of city sports activities (0.0496)	D111 has a specific annual target (0.0167) D112 has a scientific and specific implementation plan (0.0178) D113 has a target evaluation mechanism (0.0159) D121 participation in sports activities accounted for the proportion of the total population (0.0240) D122's breadth of participation in sports activities (0.0226) D132 the development of traditional sports activities (0.0159) Development of characteristic sports activities in the D132 area (0.0165) D133 the development of periodic sports activities (0.0172)

Table 4. Urban sports, public service, sports organization, service index system

According to 153 leaders, managers, and owners from Vanke District and Huanggu District of Shenyang, the public sports service evaluation indicators in Shenyang were scored. According to the actual needs, the evaluation of the public sports service in the international sports centre city was divided into five grades, namely, excellent, good, general, poor, and very poor. The scoring and evaluation results were brought into the fuzzy comprehensive evaluation model. Because the calculation process was more complex and complicated, there was no

detail. The final fuzzy comprehensive evaluation results were 0.0017, 0.0037, 0.0059, 0.0053, and 0.0020, respectively. From this point of view, the level of public sports service in Shenyang was considered to be in general.

5. Conclusion

The main factors affecting the evaluation results of the public sports service in the international sports centre include the location, economic, political, cultural, and so on. The previous literature was studied in this paper, and the relevant experts were visited. Then, through the use of AHP and fuzzy comprehensive evaluation method, as well as EXCEL software and SPSS statistical tools, the relevant evaluation indicators were formulated, and many evaluation indexes were divided into five categories. Through the construction of the evaluation index model, the further screening of evaluation indexes and the calculation of weights were brought into the fuzzy comprehensive evaluation model. The fuzzy evaluation model of the public sports service in the international sports center city established in this paper mainly included the index establishment system, the weight acquisition and the fuzzy comprehensive evaluation process. Taking Shenyang as an example, based on the evaluation results of leaders, staff and owners from Vanke district from Huanggu District of Shenyang, through the use of fuzzy comprehensive evaluation, it was calculated that the level of public sports service in Shenyang was in general. Because of the time and funds restrictions in the study, the number of samples available is limited. Thus, in evaluating the current situation of public sports service in Shenyang International Sports Center, data support may not be enough, which is the inadequacy of this study, but it is also the main direction and content of follow-up research.

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