Construction on Evaluation Indication System on College Leisure PE Resources Configuration

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Abstract. The rational allocation of resources and development in college leisure PE not only meet the need of colleges' PE situation development, but also meet various leisure demands of the teachers and students. First, this article describes the significance of the evaluation system established; then construct an index system, including human resources, material resources, financial resources, organizational resources, information resources, time resources, 6 one level indicators, 30 secondary indicators; finally, establishing the mathematics model by AHP, using the geometric mean method to calculate the index weight. Through the construction of index system, analyzes the rationalization of leisure PE resources allocation. Have put forward corresponding countermeasures and suggestions to enrich college leisure PE resources allocation, and promote the healthy development of college students' leisure PE.

Introduction

Leisure PE as a social phenomenon, it is the overall behavior and environment interactions, play to their capabilities, with its own organization and management systems, financial funds, material and technical basis, faculty team and teaching research institutions, and so on; which is the leisure PE obtain effective resources, it maintains a certain independence and stability. In order to achieve the leisure PE career goals, which requires system to carry on the rational allocation to the various resources of leisure PE, to ensure the stability and development of leisure PE, leisure PE project decision built on the basis of a viable scientific analysis, so that leisure PE be benign operation, so to coordinate the development of leisure PE [1]. Because the overall evaluation by the allocation of leisure PE resources, various colleges can understand their position or rank, identify deficiencies and vulnerabilities, to specify the direction for future work.

Establishment of Evaluation Indication System

College leisure sports resources are all kinds of conditions and elements about the use of sports leisure education and leisure sports activity. Leisure sports as an important part of college sports, its implementation requires a variety of material and non-material elements. Thus college leisure sports resources including the tangible material resources, such as stadiums, sports and all kinds of sports equipment, the number of sports workers and school sports population and others; also includes certain intangible non-material resources, such as the level of school development, on the sports investment and intensity [2]. In the rational use of existing resources in college leisure sports, while research and development for the rational allocation of resources in college leisure sports education is the need to adapt to the situation development, but also to meet the teachers and students of various forms of leisure sports needs.

The establishment of Indicator System (IS) is the premise and foundation for predicting or evaluating research, the research of abstract object according to certain aspects of its essential attributes and characteristics to identity decomposition into a behavior, operational structure, and the process which is in the indicator system each constituent element (indicator) to give the corresponding weights. Through the questionnaire design, at the same time, to verify the opinions

of experts, different colleges across the country, experts in different fields, scholars to conduct questionnaire, and timely recovery. By recycling expert questionnaire, sorting and statistics obtained a new evaluation system. Leisure sports resource evaluation index system structure model shown in Fig. 1.

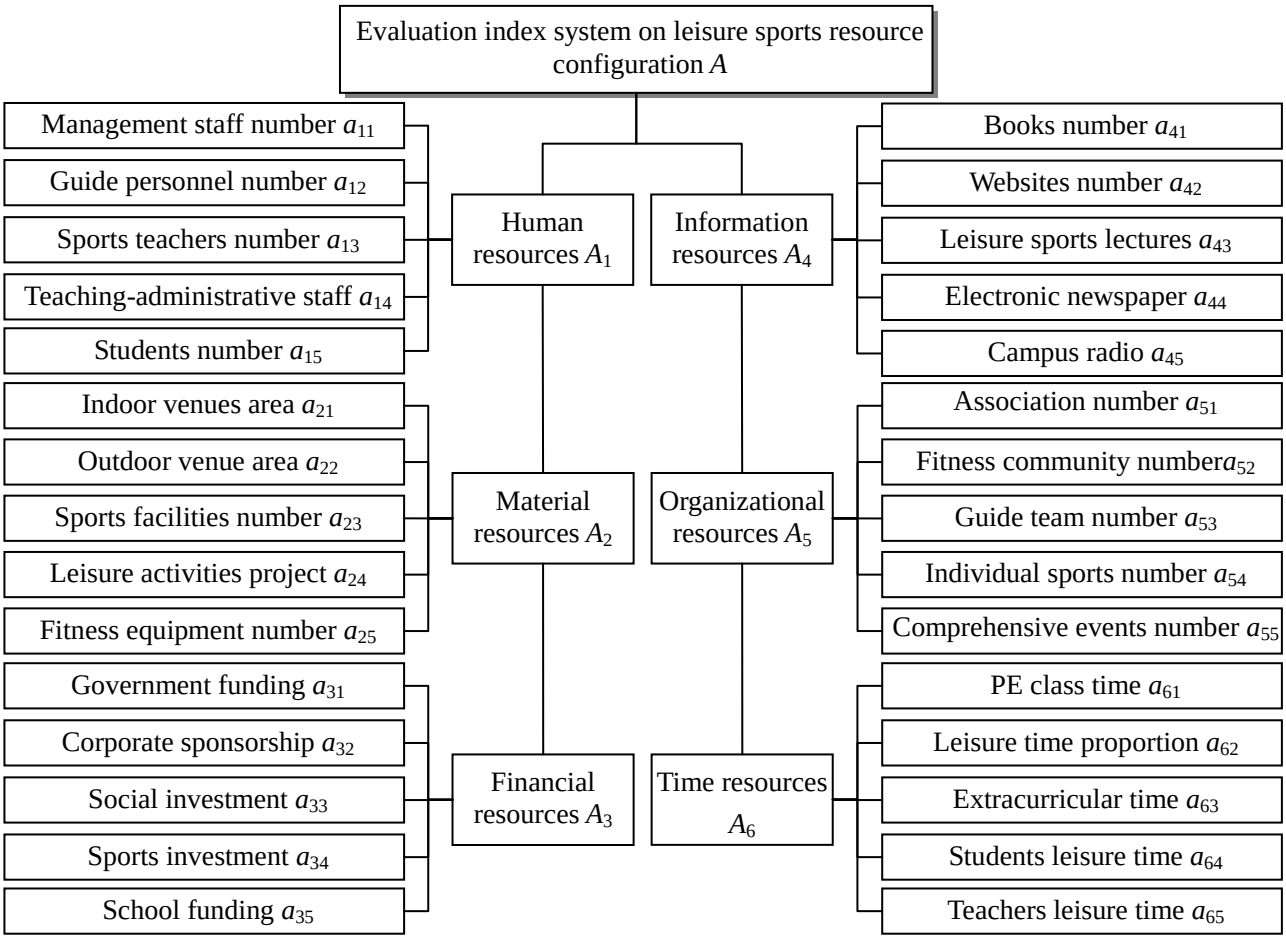

Fig. 1. Evaluation index system on leisure sports resource configuration

Establishment of Mathematical Model

Analytic Hierarchy Process (AHP) is the element associated with the decision-making down into goals, guidelines, and scheme and other levels, on this basis for decision-making method of qualitative and quantitative analysis. This method has the systems, flexible, simple advantages.

Table 1. Digital scale meaning

Scale	Indicates the degree of importance (Compared with the two indicators)
1	Compared with the two indicators, has the same importance
3	One element is slightly more important than another element
5	Obviously an element important than another element
7	An element strongly important than another element
9	An element of extreme important than another element
2、4、6、8	Median between two adjacent judgment
Reciprocal of the above value	Indexes *i* and *j* comparison was to determine C_{ij} ,indicators of *j* compared with *i* get $C_{ij} = 1/C_{ij}$

(1) Construct judgment matrix

An important feature of AHP is in the form of two importance degrees ratio shows the corresponding importance degree rank of two schemes, such as certain criteria under its n scheme to pairwise comparison, and according to its degree of importance rating. Citing numbers 1-9 and the

countdown as the scale shown in Table 1.

With one level indicator as an example, construct the two-two judgment matrix. The results are as follows:

$$A_{ij} = \begin{pmatrix} 1 & 1/4 & 1/3 & 1/2 & 2 & 1/3 \\ 4 & 1 & 1/2 & 3 & 5 & 2 \\ 3 & 2 & 1 & 3 & 6 & 2 \\ 2 & 1/3 & 1/3 & 1 & 3 & 1/2 \\ 1/2 & 1/5 & 1/6 & 1/3 & 1 & 1/4 \\ 3 & 1/2 & 1/2 & 2 & 4 & 1 \end{pmatrix}$$

(2) Hierarchical single sort and consistency test [3]:

Calculated consistency index $CI = \frac{\lambda_{\max} - n}{n-1}$, CI value larger indicates that the greater the deviation from extent of complete consistency of judgment matrix. When meet the consistency of judgment matrix, the average random consistency index RI values of judgment matrix as shown in Table 2. Find consistency index RI, calculate the consistency ratio $CR = CI/RI$. When $CR < 0.1$, the consistency of judgment matrix is considered acceptable. Otherwise, re-adjust the matrix until having a satisfactory consistency.

Table 2. Average random consistency index *RI* value

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.12	1.24	1.36	1.41	1.46	1.49

(3) Hierarchical total sort and consistency test

Hierarchical total sort also need to the consistency test, calculate the each layer elements to system target synthesis weight, and each is selected schemes sorted.

Hierarchical single sort problem can be attributed to calculate the matrix largest eigenvalue and eigenvector problems [4,5]. Calculation steps:

(1) Calculate the product M_i of judgment matrix each row element

$$M_i = \prod_{j=1}^{n} a_{ij} \tag{1}$$

(2) Calculate the *n*-th root $\overline{W_i}$ of M_i.

$$\overline{W_i} = \sqrt[n]{M_i} \tag{2}$$

(3) Vector $\overline{W_i} = \left[\overline{W_1}, \overline{W_2}, ... \overline{W_n}\right]^T$ normalization process.

$$\overline{W_i} = \overline{W_i} \Big/ \sum_{j=1}^{n} \overline{W_j} \tag{3}$$

Then $W = \left[W_1, W_2, ... W_n\right]^T$.

(4) Calculate the judgment matrix largest eigenvalue:

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i} \tag{4}$$

Calculation of Index Weight

To calculate the weight by using the geometric mean method, the calculation steps: The elements of A according to the row multiplying obtain new vector, each component of new vector open n square; the resulting vector is normalized to get the weight vector.

$$W_i = \left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}} \Bigg/ \sum_{i=1}^{n} \left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}} = \frac{(M_i)^{\frac{1}{n}}}{\sum_{i=1}^{n} (M_i)^{\frac{1}{n}}} \qquad i=1,2,\ldots,n \tag{5}$$

According to formula (1) to calculate the value of M_i are:

$M_1 = 0.5503$, $M_2 = 1.9786$, $M_3 = 2.4495$, $M_4 = 0.8327$, $M_5 = 0.3340$, $M_6 = 1.3480$.

$\sum M_i = 0.5503 + 1.9786 + 2.4495 + 0.8327 + 0.3340 + 1.3480 = 7.4931$

M_i normalized get weight components are: $W_1 = 0.0734$, $W_2 = 0.2640$, $W_3 = 0.3269$, $W_4 = 0.1111$, $W_5 = 0.0457$, $W_6 = 0.1799$.

Weight vector of one level index: $W = [0.0734, 0.2640, 0.3269, 0.1111, 0.0457, 0.1799]$.

According to the formula (4) calculated $\lambda_{\max} = 6.3138$, $CI = \dfrac{\lambda_{\max} - n}{n-1} = 0.0628$.

When $n = 6$, $RI = 1.24$, therefore $CR = 0.0506$, $CR < 0.1$, matrix satisfies consistency.

The each secondary indicators weight calculation result is respectively:

$W_{A1} = [0.0814, 0.3531, 0.2647, 0.1652, 0.1356]$, $W_{A2} = [0.1129, 0.1547, 0.2684, 0.1897, 0.2743]$

$W_{A3} = [0.2648, 0.1286, 0.3326, 0.1983, 0.0757]$, $W_{A4} = [0.0969, 0.2465, 0.2950, 0.1740, 0.1876]$

$W_{A5} = [0.2869, 0.1456, 0.1664, 0.2413, 0.1598]$, $W_{A6} = [0.0524, 0.3542, 0.1427, 0.2624, 0.1883]$

Each secondary indicators judgment matrix satisfies consistency.

Conclusion

By the relative weight of the various indicators in leisure sports evaluation system can be seen, material resources and financial resources is the priority among priorities of leisure sports resources in evaluation system. To effectively attention to the construction of students' leisure sports education and campus sports culture, strengthen the cultivation of lifetime sports concept and leisure sports consciousness; increase the print media and three-dimensional media publicity on leisure sports efforts. The rational allocation of college leisure sports resources, increase the number of leisure sports instructor [6]. While Many organizations can play an important complementary role, such as the local leisure services agencies, by providing leisure sports activities guidance, resources information, teaching arrangements, leisure counseling, and other mode, these organizations can participate in college leisure sports, in order to improve the configuration situation of existing college leisure sports resources.

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