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Research on construction of innovative evaluation system about rural sports' basic public service supply mechanism in China

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ABSTRACT

As sports cause of China develops and grows constantly, rural sports of our country also advances rapidly. Currently, basic public service construction of rural sports is weak. Thus, it is essential to construct innovative evaluation system about rural sports' basic public service supply mechanism to solve the problem. Just under this background, this thesis constructs the innovative evaluation system about rural sports' basic public service supply mechanism. The system is an internal demand of rural sports development in the new historical period. By using analytic hierarchy model, indexes of three hierarchies are determined, whose number is 4, 11 and 28, respectively. Meanwhile, weight of each index is confirmed one of the items is listed to construct the evaluation system. Via fuzzy evaluation, the obtained result is U=(0.013, 0.022, 0.001, 0.003). According to the principle maximum membership degree, we may know construction of innovative evaluation system about rural sports' basic public service supply mechanism belongs to a good hierarchy, which proves construction of the model can be used for reference.

KEYWORDS

Public service of rural sports; Analytic hierarchy process; Fuzzy evaluation.

INTRODUCTION

Since Reform and Opening-up, Chinese government has paid much attention to sports cause constantly. The third plenary session of the 18th National Congress of the Communist Party of China focuses on emphasizing China should establish and perfect public service system of rural sports and constantly strengthen construction of innovation about rural sports' basic public service supply mechanism as a great agricultural country. Up to now, many scholars have studied construction of innovative evaluation system about rural sports' basic public service supply mechanism.

Predecessors have made many efforts to study basic public service or our rural sports and got some achievement simultaneously. For instance, in 2012, Zhu Wanqing wrote research on rural public sports service. By analyzing current status of basic public service of rural sports, it can be found that construction of our rural sports' basic public service is relatively weak. In order to change this status, we must excavate in the aspect of innovation of rural sports' basic public service.

Peng Yan studied county-level government's supply for public service of rural sports, compared public service of rural sports in China with that in foreign countries, found out shortages existing in public service of our rural sports and proposed countermeasures to improve the phenomenon.

Just on the basis of predecessors' research, this thesis establishes innovative evaluation system about rural sports' basic public service supply mechanism. By using methods like chromatography analysis, questionnaire, mathematical statistics and fuzzy comprehensive evaluation to implement research, the results it concludes finally are of great value for research in the field in future.

MODELING

Objective selection

So far, construction of innovation about rural sports' basic public service supply mechanism in China has become a priority among priorities for rural sports construction of China. To develop public service construction of rural sports, we should evaluate innovation level of sports public service supply mechanism and establish perfect innovative evaluation system about rural sports' basic public service supply mechanism.

By reading a number of related literatures, investigating development of rural sports and consulting related index system, the innovative evaluation index system about rural sports' basic public service supply mechanism in China is prepared (see details in TABLE 1).

Establishing analytic hierarchy model

Determining weight of each index according to the analytic hierarchy process

The analytic hierarchy process (UHP) is a way to make selected objects constitute a hierarchy-shape structure and adopt pairwise comparison for each scheme at the same hierarchy based on requirements and natures of proposed questions in order to decide each scheme's index weight under different hierarchies.

Specific weights of each evaluation index

This thesis can solve weight of each index by using MCE-UHP software and each weight may be compared with others. Specific results are shown as follows.

The first-level index weights:

U1 (0.446), U2 (0.164), U3(0.285), U4(0.105)

The second-level index weights:

M11(0.420), M12(0.269), M13(0.190), M14(0.121);

TABLE 1 : The innovative evaluation index system about rural sports' basic public service supply mechanism

The first-level indexes	The second-level indexes	The third-level indexes
U1 sport resources	M11 sports site facilities	N111 the number of stadiums (sports centers) per 10,000 people
		N112 the number of fitness sites for morning (evening) exercise per 10,000 people
		N113 the number of monitoring sites for physique per capita in the whole village
		N114 the number of sports guidance and activity sites per capita in the whole village
	M12 sports funds	N121 growth rate o financial appropriation
		N122 sports cause funds per capita
	M13human resources for sports	N131 the number of national-level judges and above (1/ 10,000 people)
		N132 the number of provincial athletes and above (1/ 10,000 people)
		N133 the number of social sports guides per 10,000 people in the whole village
	M14sports organizations	N141 the number of formal organizations
		N142 informal organizations
U2 social benefits	M21 sports population	N211 growth rate of sports population
		N212 the ratio of sports population to total population
	M22 physical constitution status	N221 the ratio of the number of villagers (excluding students) reaching a standard excellent level to total population of the village
		N222 the ratio of the number of villagers (excluding students) reaching a standard and qualified level to total population of the village
	M23 development of sports activities	N231 The number of the whole-village-level sports meetings held each year
		N232 the number of held village–level athletic contests and above
		N233 the number of the whole village's fitness activities
U3 security system	M31 construction of rules and regulations	N311 supervisory system
		N312 reward system
		N313 performance evaluation system
		N314 degree of attention paid by leaders
	M32 scientific and technological information guarantee	N321 the number of lectures and publicities about popularization of sports science
		N322 the number of approved scientific research projects about sports public service
U4 local features	M41 characteristic activities	N411 the number of characteristic activities and projects
		N412 the number of traditional activities and projects
	MM42 characteristic service	N421 yearly characteristic service exhibition
		N422 the number of characteristic activities and projects

TABLE 2 : Judgment matrix

U_{ij}	U1	U2	A_{ij}
U1	1	$\frac{1}{2}$	2

U2	2	1	5
U_{ij}	$\frac{1}{2}$	$\frac{1}{5}$	1

TABLE 3 : Proportional scale and its connotation of judgment matrix

No.	Grade of importance	A_{ij} assignment
1	The two elements i and are equally important	1
2	The element i is a little more important than j	3
3	The element i is obviously more important than j	5
4	The element i is strongly more important than j	7
5	The element i is extremely more important than j	9
6	The element i is a little less important than j	1/3
7	The element i is obviously less important than j	1/5
8	The element i is strongly less important than j	1/7
9	The element i is extremely less important than j	1/9
10	$A_{ij} = \{2,4,6,8,1/2,1/4,1/6,1/8\}$ in $A_{ij} = \{1,3,5,7,9,1/3,1/5,1/7,1/9\}$	The foregoing characters are decided according to judgment

M31(0.667), M32(0.333);

M21(0.547), M22(0.109), M23 (0.335);

M41(0.667), M42(0.333)

The third-level index weights:

N111(0.276), N112(0.506), N113(0.070), N114(0.148);

N121(0.25), N122(0.75);

N131(0.117), N132(0.268), N133(0.614);

N141(0.667), N142(0.333);

N211(0.333), N212(0.667);

N221(0.75), N222(0.25);

N231(0.661), N232(0.208), N233(0.131);

N311(0.477), N312(0.087), N313(0.140), N314(0.297);

N321(0.75), N322(0.25);

N411(0.5), N412(0.5);

N421(0.667), N422(0.333)

Total ranking of hierarchies

In accordance with nature of AHP, we may obtain combination weight by multiplying weights which belong to different hierarchies but have consistency, i.e., position of the index in total objective appraisal.

M_1, M_2 and M_3 in the following table (TABLE 4) are the second-level indexes and their total ranking has been finished. Single ranking results of indexes at the lower hierarchy, i.e., N_{11}, N_{12},..... N_{12}, which are corresponding to M1, are shown in the following table. Weight of each index in the total ranking is obtained by multiplying the second-level ranking weight of each index and the weight that is corresponding to the up one level, and its raking result is shown as follows.

TABLE 4 : Total ranking of Hierarchy N

Hierarchy N	Hierarchy M	Total ranking of Hierarchy M
	M_1 M_2 M_3	
	0.297 0.5397 0.1635	
N11	0.3187	0.0946
N12	0.2046	0.0606
N13	0.4766	0.1418
N21	0.3729	0.2013
N22	0.2015	0.1088
N23	0.2651	0.1433
N24	0.1604	0.0867
N31	0.6671	0.01088
N32	0.3330	0.0545
∑W	1.0000 1.0000 1.0000	1.0000

Final determination about innovation evaluation index weight of Chinese rural sports' public service supply mechanism

According to weights of the first-level and the second-level indexes, determine final weights of innovative evaltion indexes about Chinese rural sports' public service supply mechanism.

TABLE 5 : Innovative evaluation index system about Chinese rural sports' basic public service supply mechanism

The first-level index	The second-level index	The third-level index
U1 0.446	M11 0.184	N111（0.116）
		N112（0.213）
		N113（0.023）
		N114（0.062）
	M12 0.1197	N121 (0.067)
		N122 (0.150)
	M13 0.0846	N131 (0.022)
		N132 (0.051)
		N133 (0.117)
	M14 0.0541	N141 (0.081)
		N142 (0.040)
U2 0.164	M21 0.0899	N211 (0.182)
		N212 (0.377)
	M22 0.1078	N221 (0.027)
		N222 (0.081)
	M23 0.055	N231 (0.070)
		N232 (0.044)
		N233 (0.221)
U3 0.285	M31 0.190	N311 (0.377)
		N312 (0.058)
		N313 (0.093)
		N314 (0.198)

U4 0.105	M32 0.095	N321 (0.250)
		N322 (0.083)
	M41 0.070	N411 (0.333)
		N412 (0.333)
	M42 0.035	N421 (0.222)
		N422 (0.111)

Fuzzy comprehensive evaluation on innovative evaluation system about Chinese rural sports' basic public service supply mechanism

A model about fuzzy comprehensive evaluation

Fuzzy comprehensive evaluation is a way to judge a thing is affected by many factors. This method can make research results clearer and solve problems like fuzziness and difficulty in quantization. Based on foregoing materials, this thesis establishes an innovative evaluation model about Chinese rural sports' basic public service supply mechanism.

The mathematical model about fuzzy comprehensive evaluation is composed of three factors and it involves 4 steps:

Factor set $U = (u_1, u_2, u_3, ...u_n)$

Evaluation set $V = (v_1, v_2, ..., v_m)$

Factor judgment

$$f : U \to \phi(V)$$

$$u_i \to f(u_i) \in \phi(U)$$

The fuzzy relation R drives from the mapping f and its corresponding relational expression is $R_f \in \varphi(U \times V)$, i.e., $R_f(u_i, v_i) = f(u_i)(v_i) = r_{ij}$. Thus, the fuzzy matrix $R \in \mu_{m \times n}$ can be expressed as:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix}$$

R in the foregoing formula is called evaluation matrix by which fuzzy change boundaries can be educed to form a fuzzy comprehensive evaluation model. With respect to its results, the result of comprehensive evaluation is obtained in accordance with the principle of maximum membership degree, i.e., corresponding order of evaluation.

Judgment on innovative evaluation system about rural sports' public service supply mechanism

Selecting and determining index system and weights (see details in TABLE 6)

TABLE 6 : Some selected indexes

U1 0.446	M11 0.184	N111 (0.116)
		N112 (0.213)
		N113 (0.023)
		N114 (0.062)
	M12	N121 (0.067)

0.1197	N122 (0.150)
M13 0.0846	N131 (0.022)
	N132 (0.051)
	N133 (0.117)
M14 0.0541	N141 (0.081)
	N142 (0.040)

Based on foregoing research conclusions, select some index system and weights.

Judgment on innovative evaluation system about Chinese rural sports' public service supply mechanism

On the basis of demands, innovative evaluation system about Chinese rural sports' public service supply mechanism is divided into 5 grades, i.e., very good, good, ordinary, poor and rather poor. At the same time, 10 people are selected for evaluation (as shown in TABLE 7).

TABLE 7 : A statistical table for evaluation

Sports	V_1		V_2		V_3		V_4		V_5	
Resource	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion
μ_{111}	4	0.4	4	0.4	1	0.	3	0.3	0	0.0
μ_{112}	3	0.3	4	0.4	3	0.3	0	0.0	0	0.0
μ_{113}	4	0.4	3	0.3	4	0.4	1	0.1	2	0.2
μ_{114}	2	0.2	4	0.4	2	0.2	1	0.1	0	0.0
μ_{115}	1	0.1	2	0.2	2	0.2	2	0.2	2	0.2
μ_{116}	3	0.3	4	0.4	4	0.4	0	0.0	1	0.1
μ_{117}	1	0.1	2	0.2	5	0.5	2	0.2	4	0.4
μ_{118}	0	0.0	3	0.3	4	0.4	2	0.2	1	0.1
μ_{119}	4	0.4	1	0.1	3	0.3	3	0.3	3	0.3
μ_{120}	3	0.3	3	0.3	2	0.2	2	0.2	0	0.0
μ_{121}	2	0.2	3	0.3	4	0.4	2	0.2	2	0.2

In accordance with the foregoing theory and by using mce-fozzy software to process and calculate data in the above, we may obtain the following results.

The third-level indexes:

N111=(0.066,0.044,0.029,0.030,0.007)

N112=(0.015,0.032,0.035,0.026,0.001)

N113=(0.024,0.029,0.038,0.025,0.001)

N114=(0.009,0.001,0.041,0.005,0.004)

The second-level indexes

M11=(0.0014,0.0036,0.0064,0.0004,0.0012)

M12=(0.0013,0.0031,0.0064,0.0066,0.0015)

M13=(0.0141,0.0037,0.0091,0.0023,0.0021)

M14=(0.0046,0.0039,0.0052,0.0037,0.0015)

M21=(0.0061,0.0091,0.0012,0.0015,0.0001)

M22=(0.0016,0.0031,0.0051,0.0052,0.0016)

M31=(0.0020,0.0042,0.0058,0.0046,0.0020)

M32=(0.0020,0.0035,0.0061,0.0041,0.0016)
M33=(0.0015,0.0035,0.0032,0.0053,0.0023)

M41=(0.0026,0.0034,0.0061,0.0043,0.0016)

M42=(0.0016,0.0032,0.0047,0.0016,0.0042)

Final result:

U=(0.013，0.022，0.001，0.003)

According to the principle of maximum membership degree, we may know construction of innovative evaluation system about Chinese rural sports' basic public service supply mechanism belongs to a better grade, which proves construction of this mode is of reference value.

CONCLUSION

Construction of innovative evaluation system about Chinese rural sports' basic public service supply mechanism is an internal demand of rural sports development in the new historical period. Just under this background, this thesis establishes its corresponding evaluation system, determines weight of each index by using the analytic hierarchy model and lists on item to construct the evaluation system. By virtue of fuzzy evaluation method, it finally concludes that the established innovative evaluation system about Chinese rural sports' basic public service supply mechanism accords with requirements and is of reference value.

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