

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(10), 2014 [4743-4750]

The fuzzy comprehensive evaluation research of the impact of social sports development related to the governments' functions

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ABSTRACT

It is quite necessary for the government to manage the sports, the functions of the government can be reasonable planed, which can accelerate the rapid development of sports industry in our country, on the basis of the fuzzy comprehensive evaluation, this paper makes fuzzy comprehensive evaluation based on equipment facilities, department revitalization, tissue culture, and the coach training these four aspects.

KEYWORDS

Fuzzy theory; Functions of the government; Sports development; Mathematical model.



INTRODUCTION

Fuzzy mathematics came from people's cognition to the outside world, because it is influenced by many factors, human cognition is fuzzy. Fuzzy mathematics theory system which is formed by the fuzzy set and fuzzy logic is applied to pattern recognition and artificial intelligence. As a relatively new subject, fuzzy mathematics set some of the factors, and performance into the consciousness of the people. On establishing an object property scale, we make fuzzy mathematical analysis of a particular object.

Take the Japanese government as an example; in 1972 the Japanese government puts forward to establishing daily life circle, the company sports and wide-area outdoors life circle then establishing three types of national sports according to the different characteristics and the present situation of the population. Japanese government devote to the investment of physical industry. From 1971 to 1997, the Japanese government budget of sports facilities and public sports facilities budget increased year by year, the growth is very fast.

TABLE 1 : Japanese government budget of sports facilities and public sports facilities in the budget from 1971 to 1997

Times	Total economic budget (\$)	sports facilities budget (\$)
1971	250.13000	6.07500
1972	340.97043	16.34000
1973	580.40050	31.18850
1974	790.31950	47.96750
1988	1608.46429	66.01441
1989	1704.7438	78.42479
1990	1706.13117	80.05529
1991	1709.33463	78.13529
1992	1906.16537	89.70800
1995	2502.09828	123.57016
1996	2402.63565	122.47715
1997	2002.50000	74.80000

From TABLE 1, we can get Figure1, the total economic budget and Figure 2 the sports facilities budget



Figure 1 : the total economic budget charts

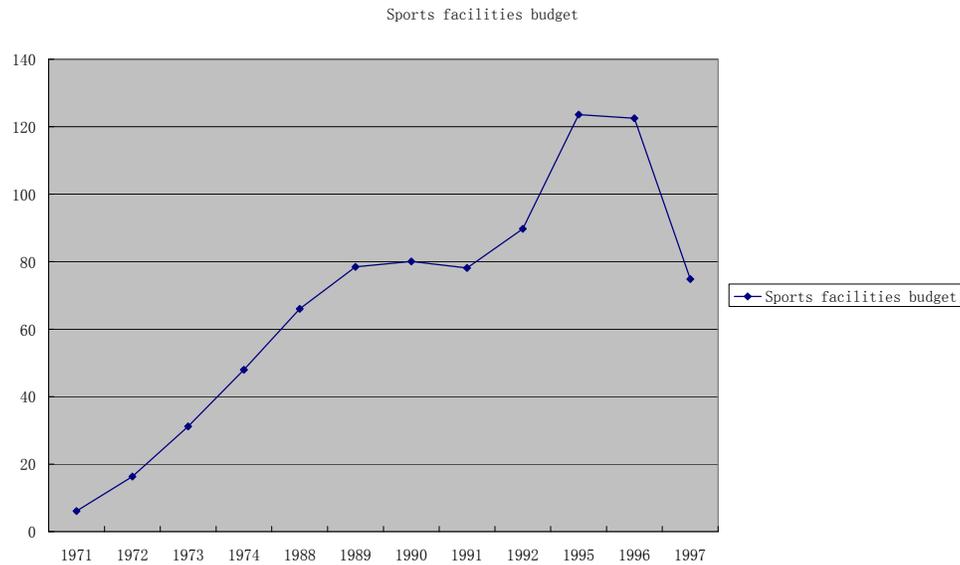


Figure 2 : sports facilities budget charts

From the analysis of the Figure 1 and Figure 2, we can see that the budget of the sports facilities are increasing year by year with the growth of the national economy.

THE ESTABLISHMENT OF FUZZY EVALUATION MODEL

Fuzzy comprehensive evaluation model

Using the fuzzy comprehensive evaluation, the steps are as follows:

(1) Establish factor set U , $U = (U_1 \ U_2 \ \dots \ U_k)$;

(2) Establish evaluation factor set V (evaluation factor);

(3) Establish the fuzzy mapping of judgment matrix from U to V , and get $R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$

(4) Establish the weight set, $A = (a_1, a_2, \dots, a_n)$, Meet the conditions: $\sum_{i=1}^n a_i = 1 \quad a_i \geq 0$

(5) Every line of fuzzy relations R reflects the influential degree of factors to the judge of the object of that line. At the same time, every list of R , R reflects the influential degree of factors to the judge of the object of that list.

$$\sum_{i=1}^n r_{ij} \quad j = 1, 2, 3, \dots, m$$

$$B = A \cdot R$$

$$= (a_1, a_2, a_3, \dots, a_n) \cdot \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

$$= (b_1, b_2, b_3, \dots, b_n)$$

The fuzzy set on V is judge set B . In the conclusion statement the fact change model is

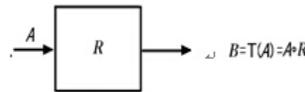


Figure 2 : the change mode

As shown in Figure 2, we get the change model of the fuzzy comprehensive evaluation, then we can establish the corresponding transformation function, the various factors assessment evaluation, the membership function factors u_1, u_2, u_3, u_4, u_5 can be expressed as follows:

$$u_{v_1}(u_i) = \begin{cases} 0.5(1 + \frac{u_i - k_1}{u_i - k_2}), & u_i \geq k_1 \\ 0.5(1 - \frac{k_1 - u_i}{k_1 - k_2}), & k_2 \leq u_i < k_1 \\ 0, & u_i < k_2 \end{cases}$$

$$u_{v_2}(u_i) = \begin{cases} 0.5(1 - \frac{u_i - k_1}{u_i - k_2}), & u_i \geq k_1 \\ 0.5(1 + \frac{k_1 - u_i}{k_1 - k_2}), & k_2 \leq u_i < k_1 \\ 0.5(1 - \frac{u_i - k_3}{k_2 - k_3}), & k_3 \leq u_i < k_2 \\ 0.5(1 - \frac{k_3 - u_i}{k_2 - u_i}), & u_i < k_3 \end{cases}$$

$$u_{v_3}(u_i) = \begin{cases} 0, & u_i \geq k_2 \\ 0.5(1 - \frac{k_1 - u_i}{k_2 - k_3}), & k_3 \leq u_i < k_2 \\ 0.5(1 + \frac{k_3 - u_i}{k_2 - u_i}), & u_i < k_3 \end{cases}$$

The fuzzy evaluation model of la la gymnast

Establish factor set U , among them $U = (U_1, U_2, U_3, U_4)$. U_1 represents facilities, U_2 represents personnel training, U_3 represents tissue culture, U_4 represents working progress, then we get TABLE 3.

TABLE 3 : The government’s evaluation index system of undertakings of physical culture and sports

Facilities U_1	Personnel training U_2	Tissue culture U_3	Working progress U_4
The introduction of facilities u_{11}	The cultivation of the coaches u_{21}	Match u_{31}	Business introduction u_{41}
Facilities maintenance u_{12}	The cultivation of the teachers u_{22}	Activity u_{32}	Career development u_{42}

The construction of the competition facilities u_{13}	The introduction of the foreign coaches u_{23}	Speech u_{33}	The revitalization of traditional business u_{43}
The construction of the daily facilities u_{14}	The fee of the cultivation u_{24}	Outbound u_{34}	
Equipment maintenance and replacement u_{15}			

We can get the evaluation set from the factors in TABLE 3.

$$U_1 = \{u_{11}, u_{12}, u_{13}, u_{14}\}$$

$$U_2 = \{u_{21}, u_{22}, u_{23}, u_{24}, u_{25}\}$$

$$U_3 = \{u_{31}, u_{32}, u_{33}\}$$

$$U_4 = \{u_{41}, u_{42}, u_{43}, u_{44}\}$$

By collecting data and making analysis, we get the important degree of four factors, as shown in TABLE 4.

TABLE 4 : The statistics of important degree of four factors

Classification	Ranking 1	Ranking 2	Ranking 3	Ranking 4
Facilities U_1	23	7	4	0
Personnel training U_2	0	0	15	18
Tissue culture U_3	0	9	13	12
Working progress U_4	3	21	9	0

We get the tank matrix of facilities U_1 , personnel training U_2 , tissue culture U_3 , working progress U_4 by analyzing the TABLE 4:

$$U_1 = \{23, 7, 4, 0\}$$

$$U_2 = \{7, 18, 8, 0\}$$

$$U_3 = \{0, 9, 13, 12\}$$

$$U_4 = \{3, 0, 9, 21\}$$

The weighted vector from ranking 1 to ranking 2:

$$\beta = \{\beta_1, \beta_2, \beta_3, \beta_4\} = \{0.4, 0.3, 0.2, 0.1\}$$

$$U_i^* = U_i \cdot \beta^T$$

$$U_1^* = 12, U_2^* = 9.7, U_3^* = 6, U_4^* = 5$$

In this paper, we carry on the normalized processing:

$$U_1^* = 0.35, U_2^* = 0.3, U_3^* = 0.2, U_4^* = 0.15$$

And get:

$$\bar{A} = (0.35 \quad 0.3 \quad 0.2 \quad 0.15)$$

This paper gets the evaluated membership through the government functions of promoting the sports undertakings, as shown in TABLE 5.

TABLE 5 : the degree of the evaluated membership

Evaluation method	Set the score range			
	0-60	60-80	80-90	90-100
Very good	0	0	0.05	0.95
Good	0	0.05	0.9	0.05
General	0.05	0.9	0.05	0
Bad	0.95	0.05	0	0

This paper gets the TABLE 6 through the indicators of Japanese sports undertakings' evaluation.

TABLE 6 : the evaluation of Japanese sports undertaking's indicators

The layers of indicators	Evaluation of estimate	The layers of indicators	Evaluation of estimate
The introduction of facilities u_{11}	Very good	Match u_{31}	Very good
Facilities maintenance u_{12}	Very good	Activity u_{32}	Good
The construction of the competition facilities u_{13}	General	Speech u_{33}	Good
The construction of the daily facilities u_{14}	General	Outbound u_{34}	General
Equipment maintenance and replacement u_{15}	General	Business introduction u_{41}	Good
The cultivation of the coaches u_{21}	Very good	Career development u_{42}	Very good
The cultivation of the teachers u_{22}	Very good	The revitalization of traditional business u_{43}	General
The introduction of the foreign coaches u_{23}	Very good		
The fee of the cultivation u_{24}	Good		

Through the above model, we get the of weight factor's single index of the fuzzy sets:

$$U_1^* = \{U_{11}, U_{12}, U_{13}, U_{14}, U_{15}\} = \{0.25 \ 0.25 \ 0.2 \ 0.15 \ 0.15\}$$

$$U_2^* = \{U_{21}, U_{22}, U_{23}, U_{24}\} = \{0.54 \ 0.1 \ 0.24 \ 0.14\}$$

$$U_3^* = \{U_{31}, U_{32}, U_{33}, U_{34}\} = \{0.4 \ 0.3 \ 0.1 \ 0.2\}$$

$$U_4^* = \{U_{41}, U_{42}, U_{43}\} = \{0.3 \ 0.4 \ 0.3\}$$

In this paper, we get the evaluation collection through the TABLE 6, and combined with the evaluation membership degree of TABLE 3, facilities U_1 , personnel training U_2 , tissue culture U_3 , and working progress:

Facilities $U_1 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \end{pmatrix}$

Personnel training $U_2 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$

Tissue culture $U_3 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0.05 & 0.9 & 0.05 & 0 \end{pmatrix}$

Working progress $U_4 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$

$$B_i = A_i \cdot R_i$$

We carry on the normalized processing of the results of B_i and get the fuzzy evaluation

matrix: $B = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} = \begin{pmatrix} 0.07 & 0.27 & 0.13 & 0.53 \\ 0 & 0.1 & 0.4 & 0.5 \\ 0.08 & 0.46 & 0.38 & 0.08 \\ 0.14 & 0.2 & 0.3 & 0.36 \end{pmatrix}$.

And get the comprehensive evaluation value: $Z = U^* \cdot B = (0.38 \ 0.07 \ 0.24 \ 0.31)$.

CONCLUSIONS

Under the influence of history, government, the Chinese sports has great advantages in water sports, shooting project and small ball game including the badminton, table tennis. From the perspective of the Asian, track and field has been Asia's weaknesses, although our country's track and field results in Asia has a high level, but compared to developed countries like Europe and the United States, we are far worse. The value evaluation for government on facilities, personnel training, tissue culture, working progress are as follows: 0.38, 0.07, 0.24, 0.31.

ACKNOWLEDGMENT

Project topics: The philosophy and social sciences planning project in Chongqing. Project number: 2013SKZ. Project leader: Zhang Yanhui.

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