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Cheerleading education mode research under fuzzy comprehensive evaluation

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ABSTRACT

Cheerleading is becoming popular sports event among students in Chinese university campus, bring cheerleading into university education not only can improve students' physical quality, but also can speed up and increase cheerleading campus construction and humanistic construction. On the basis of letting students to get improvement in physical quality, it also increases students' cooperative ability, innovative level and else. The paper establishes fuzzy comprehensive evaluation model, firstly it should define weights, and then construct fuzzy relation matrix, finally makes operators selection. Among them, cooperative ability occupies 31%, innovative ability occupies 29%, and aesthetic judgment occupies 17%. Among them, cooperative ability, innovative ability and aesthetic judgment belong to humanistic education and cultivation range, the paper can clearly get that cheerleading is a kind of sports discipline with strong humanity.

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KEYWORDS

Cheerleading;
Fuzzy comprehensive evaluation;
Fuzzy relation matrix;
Humanistic education.

INTRODUCTION

Cheerleading is originated from America; it has stronger explosive power and combines with dance and music dynamic to perform cheerleading with passion, except for possessing higher level performance, it also requires serious team cooperation level, therefore, cheerleading is preferred by university students. Except for strengthening physique, cheerleading possesses higher humanistic effects, such as aesthetic awareness, team awareness, innovation awareness; the paper makes analysis on cheerleading education mode on the basis of fuzzy comprehensive evaluation.

Fuzzy mathematics development has already 40 years history until now, though it is a kind of new disci-

pline, it possesses extremely abundant contents theoretically, and fuzzy mathematics involves natural science, social science and other disciplines. Evaluation is a kind of human thought process, it is not linear changing. Fuzzy evaluation matrix is a kind of important evaluation method, and fuzzy comprehensive evaluation needs to go through three linkages, firstly it should define weights, and then constructs fuzzy relation matrix, finally carries out operator selection.

Chinese cheerleading under international situation, though it started late, nowadays its development is rapid and scale is expanded by year, due to favored by teenagers and university students, China has hosted first university dynamic cheerleading challenge in 2001 and had above 20 delegations. Meanwhile, some universi-

ties also organized cheerleading course. Below TABLE 1 is Chinese cheerleading championship competition teams' distribution status.

By TABLE 1, it is clear that every province cheerleading delegation number is increasing by year, number of participated people has been rapidly promoted. Among them, Guangdong, Guangxi and Sichuan three provinces have more delegations, and Guangdong has the most one, but many provinces also need to be greatly promoted and developed, such as Xinjiang, Liaoning, Zhejiang and Gansu as well as other provinces.

MODEL ESTABLISHMENT AND EVALUATION

Utilize fuzzy comprehensive evaluation steps

(1) Establish factor set U ,

$$U = (U_1 \ U_2 \ \dots \ U_k)$$

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

(3) Establish evaluation matrix fuzzy mapping from U to V , obtained fuzzy relation as following matrix show:

$$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

(4) Establish weight set, $A = (a_1, a_2, \dots, a_n)$, it meets conditions:

$$\sum_{i=1}^n a_i = 1 \quad a_i \geq 0$$

TABLE 1 : Chinese cheerleading championship competition teams' distribution status

Provinces	Year	Year	Year	Year	Year	Year	Year	Year
	2001	2002	2004	2005	2006	2007	2008	2009
	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
Guangxi	2	1	6	6	8	11	9	4
Jiangxi	3	1						
Guangdong	8		7	11	3	13	9	4
Sichuan	1	2	4	5	3	1	10	10
Hebei	2	1	1			2	1	1
Beijing	2		1	2				6
Hubei	2		1		1	1	1	3
Fujian	2	1	2	1	1	1		1
Liaoning	1							1
Shanxi			1	1	1	3	2	1
Shanghai			1	3	1	1	2	5
Shandong		1	1	2	1	1	1	2
Gansu		1			1			
Xinjiang				1			1	
Henan				2	2	2	2	1
Heilongjiang						1		1
Hunan					3	3		5
Guizhou					1			1
Zhejiang								1
Total	23	8	26	33	22	41	40	57
Number of participated people	306	95	339	368	467	916	718	1296

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(5) Fuzzy relation R every line will reflect the line influence factors to object judgment degree, meanwhile, every column will reflect the column influence factors to object judgment degree.

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

$$B = A \cdot R$$

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

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

In V , fuzzy combination is evaluation set B . Based on above described facts, actual change model is:

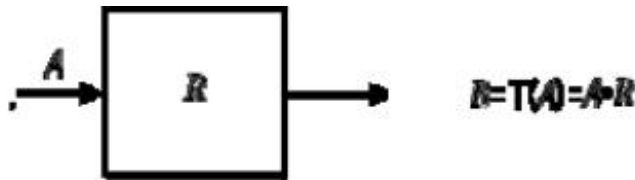


Figure 1 : Change model

As Figure 1 show, it gets fuzzy comprehensive evaluation change model, and can establish corresponding every factor grade evaluation transformation function, evaluation factors u_1, u_2, u_3, u_4, u_5 membership functions can be expressed as following:

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

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

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

Combine with fuzzy evaluation model to evaluate cheerleading athletes

Establish factor set $U, U = (U_1 \ U_2 \ U_3 \ U_4)$.

Among them, aesthetic judgment U_1 , cooperative ability U_2 , physical training U_3 , innovative ability U_4 , it gets TABLE 2.

By TABLE 2 listed factors, it gets evaluation set.

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

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

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

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

By collecting data and analyzing, it gets four kinds of factors importance ranking statistics, as Table 3 show.

By TABLE 3 sorting, it gets aesthetic judgment, cooperative ability, physical training and innovative ability four aspects' rank matrix.

$$U_2 = \{23, 7, 4, 0\}$$

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

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

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

Obtained weighted vector from rank 1 to rank 2:

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

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

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

The paper takes normalization processing:

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

It gets

$$A = (0.35 \ 0.3 \ 0.2 \ 0.15)$$

By cheerleading performance, the paper gets remarks membership, as TABLE 4 show.

By one cheerleading athlete each indicator obtained evaluation, the paper gets TABLE 5.

By above model, it gets single layer indicator weight factor fuzzy set is:

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

TABLE 2 : Cheerleading athletes' evaluation indicator system

Aesthetic judgment U_1	Cooperative ability U_2	Physical training U_3	Innovative ability U_4
Motion aesthetics u_{11}	Tactics strategies u_{21}	Endurance u_{31}	Motion innovation u_{41}
Music aesthetics u_{12}	Judgment u_{22}	Speed u_{32}	Array innovation u_{42}
Team shirts designing u_{13}	Reaction ability u_{23}	Strength u_{33}	Team shirts、 music u_{43}
Array designing u_{14}	Competition experiences u_{24}	Flexibility u_{34}	
Members training u_{15}			

TABLE 3 : Four kinds of factors importance degree ranking statistics

Classification	Rank1	Rank 2	Rank 3	Rank 4
Aesthetic judgment U_1	23	7	4	0
Cooperative ability U_2	7	18	8	0
Physical training U_3	0	9	13	12
Innovative ability U_4	3	0	9	21

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

$$U_1^* = \{U_{31}, U_{32}, U_{33}, U_{34}\} = \{0.4 \ 0.3 \ 0.1 \ 0.2\}$$

$$U_1^* = \{U_{41}, U_{42}, U_{43}\} = \{0.3 \ 0.4 \ 0.3\}$$

By TABLE 5, and combine with TABLE 3 remarks membership, the paper gets aesthetic judgment, cooperative ability, physical training, innovative ability each aspect evaluation set:

$$\text{Aesthetic judgment: } U_1 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \end{pmatrix}$$

$$\text{Cooperative ability: } U_2 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

TABLE 4: Remarks membership

Evaluation way	Set scores interval			
	0-60	60-80	80-90	90-100
Very good	0	0	0.05	0.95
Good	0	0.05	0.9	0.05
Normal	0.05	0.9	0.05	0
Bad	0.95	0.05	0	0

$$\text{Physical training: } U_3 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0.05 & 0.9 & 0.05 & 0 \end{pmatrix}$$

$$\text{Innovative ability: } U_4 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

$$B_i = A_i \cdot R_i$$

Make normalization processing with obtained B_i , it

TABLE 5 : Cheerleading athlete each indicator obtained evaluation value

Each layer indicator	Evaluation value	Each layer indicator	Evaluation value
Motion aesthetics u_{11}	Very good	Endurance u_{31}	Very good
Music aesthetics u_{12}	Very good	Speed u_{32}	Good
Team shirts designing u_{13}	Normal	Strength u_{33}	Good
Array designing u_{14}	Normal	Flexibility u_{34}	Normal
Members training u_{15}	Normal	Motion innovation u_{41}	Good
Tactics strategies u_{21}	Very good	Array innovation u_{42}	Very good
Judgment u_{22}	Very good	Team shirts、 music u_{43}	Normal
Reaction ability u_{23}	Very good		
Competition experiences u_{24}	Good		

gets fuzzy evaluation matrix.

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

It gets comprehensive evaluation value: $Z = U^* \cdot B = (0.17 \ 0.31 \ 0.23 \ 0.29)$

Because $0.31 > 0.29 > 0.23 > 0.17$, we can get cheerleading obtained weights in aesthetic judgment, cooperative ability, physical training, and innovative ability four aspects, from which, cooperative ability occupies 31%, innovative ability occupies 29%, aesthetic judgment occupies 17%. If it defines cooperative ability, innovative ability and aesthetic judgment as humanistic education and cultivation range, the paper can clearly get that cheerleading is a kind of sports discipline with strong humanity.

CONCLUSION

The paper gets that cheerleading needs to increase humanistic education proportion that not only can im-

prove students' physical quality, but also can speed up and increase cheerleading campus construction and humanistic construction. The paper establishes fuzzy comprehensive evaluation model, firstly it should define weights, and then construct fuzzy relation matrix, finally makes operators selection. Among them, cooperative ability occupies 31%, innovative ability occupies 29%, and aesthetic judgment occupies 17%.

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