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Based on the fuzzy clustering analysis of swimming back-up personnel training research

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ABSTRACT

Swimming class sport has been one of the men, women and children all like sports, swimming in China at first mainly concentrated in the river, river, lake and sea areas. With the emergence of large swimming pool in the cities, swimming class sports project has been a lot of people know, and is enjoyed by people gradually. In this paper, according to China's swimming backup talent cultivation of fuzzy clustering analysis concluded that the size of the Chinese swimming team in expanded year by year, need to strengthen management, to improve the quality of the swimming team reserve talented person well. Can see in the for the analysis of the swimming team coach coaches the overall quality is higher, age distribution is reasonable, most of the teaching process in comply with the content of the syllabus. From the above we can see in this a few kinds of Chinese athletic swimming back-up talent management is more reasonable, can satisfy the Chinese swimming for the supply of reserve talented person. At the same time also hope that the Chinese swimming team in international expectations in the big games, get good grades.

KEYWORDS

Fuzzy clustering analysis; Reserve talent; Swimming; Mathematical model.

INTRODUCTION

Swimming, as one of the major projects of Olympic Games gold medal, is the focus of all countries in the world competition. With the progress of society and the rapid development of science and technology, competitive sports competition is increasingly fierce, international powers all think highly of the development of swimming, China is no exception. The United States is the world recognized as the power of competitive swimming, it is also the United States won the gold medal in the Olympic Games sports sports, this is a good way to explain the swimming events in the international big game. As can be seen from the history, in the development process of China's swimming both brilliant, also has a trough. In the 1992 Barcelona Olympic Games achievement is outstanding, swimming class project 4 gold 5 silver; The 2000 Sydney Olympics, swimming class project medal number to crop failures; 08 Beijing Olympic Games, swimming class 1 gold, 3 silver and 2 bronze project.

As China's reform and opening up and deepen the reform of economic system, planned economy caused some sequelae always affects and restricts the Chinese swimming class athletics reserve personnel training and supply. However, corresponding to the number of reserve talented person swimming class how many quality directly affect the sustainable development of China's swimming class projects and the realization of the grand goal. Has long been China's swimming class sports reserve talented person rely mainly on the "amateur sports school, useful school, sports school, who" these three levels of training model, this model obviously can't adapt to a changing world and provide high quality swimming class well the number of reserve talented person, this model has received a certain impact. Therefore, to some extent affected the reserve talented person's raise and popularity of Chinese athletic swimming.

China's competitive swimming events in recent years has made some achievements, but with China over the years the level of competitive swimming fallen overall, investigate its reason is swimming class sports reserve talents has been can not get effective supply, leading to this period, the phenomenon of the shortage of reserve talented person. Swimming class sports reserve talented person's raise is a problem to be solved in the development of competitive sports, swimming in China needs to take seriously the present situation of reserve talented person corresponding echelon construction, only then can the development of China's competitive sports have staying power, to be able to catch up with the international advanced level.

MODEL ESTABLISHMENT

Fuzzy clustering is a method that according to data after standardization, and makes classification according to data relations and quantity sizes, it is generally applicable to correlated factors to make combination and further gather into one kind.

Fuzzy clustering analysis method

Basic thought of fuzzy relations equivalent fuzzy clustering analysis method is: due to fuzzy equivalent relation $\underset{\sim}{R}$ is domain of discourse set U and itself direct product $U \times U$ one fuzzy subset, maker proper decomposition on $\underset{\sim}{R}$, here use λ to express horizontal cut set on $\underset{\sim}{R}$, the cut $U \times U$ one general subset $\underset{\sim}{R}_{\lambda}$ is U one equivalent relation, and so it also get one kind of classification of U classified objects elements. When λ falls from 1to 0, obtained classification changes from fineness to coarseness, and gradually merge so that form into a dynamic clustering tree diagram. Thereupon, classification object set U fuzzy equivalent relation $\underset{\sim}{R}$ establishment is one key link in the clustering analysis method[11].

Establish fuzzy equivalent relation:

In order to establish object classification set U relation $\underset{\sim}{R}^*$, generally we need to firstly calculate each classified object similarity statistics, establish classification object set U fuzzy similarity relation that is defined as $\underset{\sim}{R}$.

Fuzzy similarity relation establishment regarding each classification object similarity statistics r_{ij} computing, except for adopting included angle cosine formula and similarity coefficient formula, it can also adopt following computational formulas.

Dot product method:
$$r_{ij}=\begin{cases}1 & i=j\\ \sum_{k=1}^{n}x_{ik}x_{jk}/M & i\neq j\end{cases}(i,j=1,2,\cdots,m)$$

In above formula, M is a proper selected positive number, in general, it should meet: $M>\max\limits_{i\neq j}\left\{\sum_{k=1}^{n}x_{ik}x_{jk}\right\}$

Absolute value difference method:
$$r_{ij}=\begin{cases}1 & i=j\\ 1-c\sum_{k=1}^{n}\left|x_{ik}-x_{jk}\right| & i\neq j\end{cases}(i,j=1,2,\cdots,m)$$

In above formula, c is a proper selected positive number, let $0\le r_{ij}\le 1(i\neq j)$.

Max-min method:
$$r_{ij}=\frac{\sum_{k=1}^{n}\min(x_{ik},x_{jk})}{\sum_{k=1}^{n}\max(x_{ik},x_{jk})}(i,j=1,2,\cdots,m)$$

Arithmetic average minimum method:
$$r_{ij}=\frac{\sum_{k=1}^{n}\min(x_{ik},x_{jk})}{\frac{1}{2}\sum_{k=1}^{n}(x_{ik},x_{jk})}(i,j=1,2,\cdots,m)$$

Absolute value index method: $r_{ij}=e^{-\sum_{k=1}^{n}\left|x_{ik}-x_{jk}\right|}(i,j=1,2,\cdots,m)$

Index similarity coefficient method:
$$r_{ij}=\frac{1}{n}\sum_{k=1}^{n}e^{-\frac{3}{4}}\cdot\frac{(x_{ik}-x_{jk})^2}{s_k^2}(i,j=1,2,\cdots,m)$$

In above formula, s_k is the k indicator variance, that: $s_k = \sqrt{\frac{1}{m}\sum_{i=1}^{m}(x_{ik} - \bar{x}_k)^2}$

Transform fuzzy similarity relation $\underset{\sim}{R}$ to fuzzy equivalent relation $\underset{\sim}{R}^*$. Due to similarity relation $\underset{\sim}{R}$ meets symmetry and reflexivity, but generally speaking, it doesn't meet rule of downward transmitting, that is to say, it is not equivalent relation . Therefore, in order to effective cluster, we should adopt closure transitive attribute to transform the fuzzy similarity relation $\underset{\sim}{R}$ to fuzzy equivalent relation $\underset{\sim}{R}^*$. Transformation method is to square $\underset{\sim}{R}$, that is:

$$\underset{\sim}{R}^2 = \underset{\sim}{R} o \underset{\sim}{R}$$
$$\underset{\sim}{R}^4 = \underset{\sim}{R}^2 o \underset{\sim}{R}^2$$

In this way, it surely will exists a natural number K, let: $\underset{\sim}{R}^{2k} = \underset{\sim}{R}^k o \underset{\sim}{R}^k = R^k$

Then, $\underset{\sim}{R}^* = \underset{\sim}{R}^k$ is a equivalent relation.

Maximum fuzzy spanning tree-based fuzzy clustering analysis method

Here, except for making clustering analysis according to equivalent relations, we can also establish classification object set fuzzy similarity relation. Clustering analysis process based on maximum fuzzy spanning tree, its steps is as following.

Step one: First construct a mutually fuzzy diagram. Then operate the step as following method:

First calculate classification items' similarity statistics as $r_{ij} = (i, j = 1,2,\cdots,m)$, and then establish classification object set U corresponding similarity relation $\underset{\sim}{R} = (r_{ij})_{m\times n}$.

Express $\underset{\sim}{R}$ as a m pieces of nodes composed fuzzy diagram $G = (V, E),$ let G any two nodes V_i and V_j to have each side to connect, and endow the side weight as r_{ij}.

If make classification on five factors composed object, its set $V = \{v_1, v_2, \cdots v_n\}(n = 5)$, then process with its original data by selecting clustering elements, it gets following similarity fuzzy relation:

$$\underset{\sim}{R} = \begin{Bmatrix} 1 & 0.7 & 0.6 & 0.1 & 0.3 \\ 0.7 & 1 & 0.7 & 0.3 & 0.8 \\ 0.6 & 0.7 & 1 & 0.4 & 0.9 \\ 0.1 & 0.3 & 0.4 & 1 & 0.1 \\ 0.3 & 0.8 & 0.9 & 0.1 & 1 \end{Bmatrix}$$

Step two: Construct fuzzy maximum spanning tree here. It gets fuzzy diagram G maximum weight algorithm, it can operate according to following methods:

(1) Find out G maximum weight edge r_{ij} ;

(2) Put r_{ij} in the set C, put r_{ij} corresponding new nodes in a set T, if T already contains m pieces of nodes, now move to (4) ;

(3) Check T every data and T external nodes composed weights, find out their maximum value r_{ij} , then repeat step (2) ;

(4)End, now G edge is composed of G maximum fuzzy spanning tree $T_{\max}$.

According to above algorithm, it can solve its maximum fuzzy spanning tree $T_{\max}$.

Hereto, $T_{\max}$ has following three corresponding features:

(1) it has no circuit, therefore is tree ;

(2) its corresponding original G all nodes are the same, therefore it is Figure G corresponding spanning tree;

(3) To G their any spanning tree T , all can have: $T_{\max}$ weights sum is equal or above T each side weight sum. Therefore, $T_{\max}$ is surely G maximum fuzzy spanning tree.

Step three: during maximum fuzzy spanning tree fuzzy clustering analysis process, its concrete operation is: select a λ value as a cut set, to $T_{\max}$, edges that isn't above λ breaks here, let connected each point to compose a large class, when λ falls from 1to 0 here, obtained classification changes from fineness to coarseness, corresponding each node representative classification data has gradually been merged into a class, and further form into a clustering dendrogram.

To above maximum fuzzy spanning tree $T_{\max}$, when respectively select $\lambda = 1, \lambda = 0.9, \lambda = 0.8, \lambda = 0.7, \lambda = 0.4$, the process can get a clustering dendrogram. Correspond to above analysis, list out flow chart of concrete process here as Figure 1.

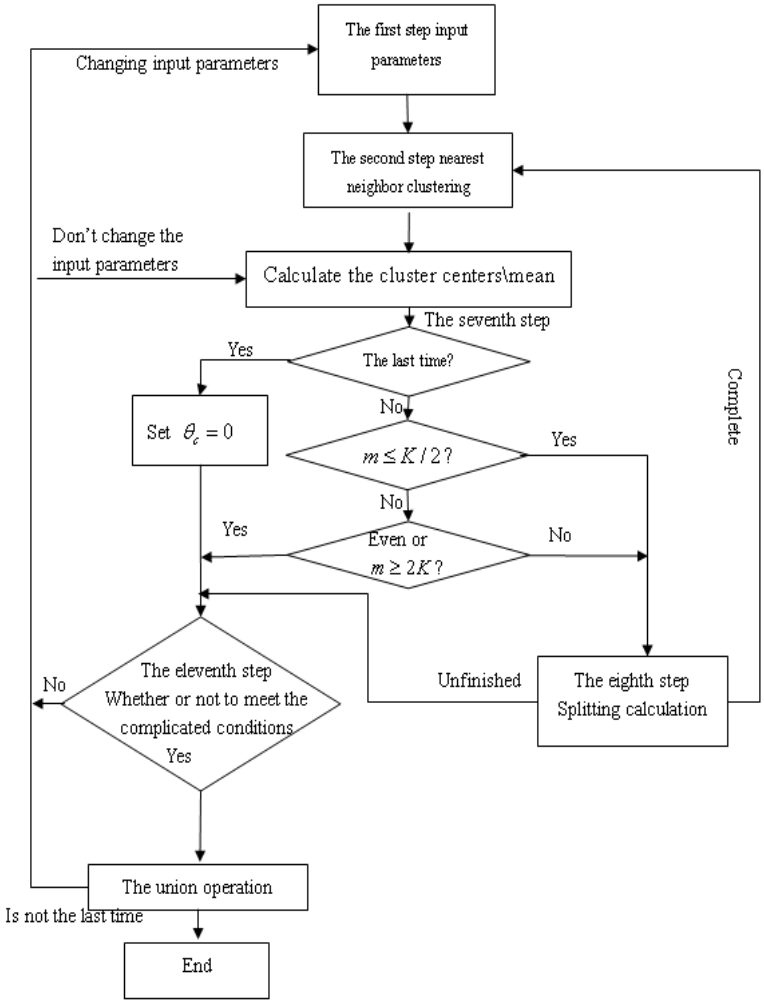

Figure 1 : Hierarchical diagram

Results analysis

To Chinese swimming reserve talent cultivation, firstly analyze reserve talent learning problems, its results is as TABLE 1.

TABLE 1: Swimming reserve talent learning problems

Rank	Option	Frequency	Percentage
1	Insufficient study time	287	69.70%
5	The foundation is poor, lack of interests	52	12.60%
3	Training is too tired, has no energy	89	21.60%
4	Method is wrong	56	13.60%
2	Haven't form into learning habits	108	26.20%
8	School entrance requirement is low, has no impetus	4	1.00%
7	Coaches and cultural course teachers don't care enough	14	3.40%
6	Others	43	10.40%

Correspond to above data; it makes "black and white bar chart" as Figure 2.

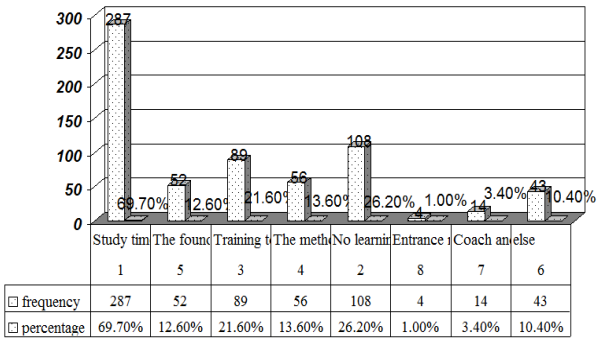

Figure 2 : Swim reserve talents in learning problems

Correspond to above analysis; it is clear Chinese swimming reserve talent main problem that come across in learning is “insufficient learning time” that accounts for 69.70% of total.

Then analyze corresponding swimming training instructors familiar status about swimming teaching “outline”, its statistical results is as TABLE 2.

TABLE 2 : Swimming trainer familiar status on “outline”

Option	Frequency	Valid percentage	Accumulative percentage
Know somebody well	17	25.80%	25.85%
To be familiar to	32	48.50%	74.30%
Ordinary	14	21.20%	95.50%
Not too familiar	2	3.00%	98.50%
Unfamiliar	1	1.50%	100%

Correspond to above data; it makes “black and white pie chart” as Figure 3.

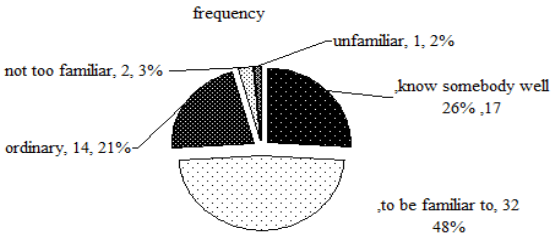

Figure 3 : Swimming trainer to familiar with the situation of "outline"

From above statistical analysis, we are clear that Chinese present swimming trainers wholly are familiar to swimming teaching “outline”, it occupies 74.30% of total, and there is still 1.5% swimming trainers are unfamiliar to swimming teaching “outline”, for the status, we should strict with quality of swimming trainers, only then can better improve Chinese swimming reserve talent cultivation.

Then targeted swimming trainers, analyze teaching “outline” execution status, its results as TABLE 3.

TABLE 3 : Swimming trainers’ teaching “outline” execution status

Option	Frequency	Valid percentage	Accumulative percentage
In strict accordance with the program execution	16	24.20%	24.20%
Reference outline, slightly higher than the general outline	19	28.80%	53.00%
Reference outline, slightly below the outline requirements	16	24.20%	77.20%

Experience is given priority to, the occasional reference outline	13	19.70%	96.90%
Regardless of the outline	2	3.00%	100.00%

Correspond to above data; it makes “black and white pie chart” as Figure 4.

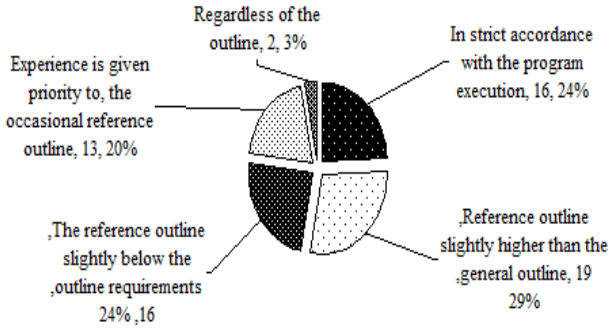

Figure 4 : Swimming trainer to perform the teaching curriculum

Correspond to above analysis, it is clear when Chinese swimming trainer is teaching, mostly rely on swimming teaching outline to give lectures, only 3.00% swimming trainers ignore swimming teaching outline.

Finally, make investigation and statistical analysis of swimmers’ training motivation, training participation motivations mainly include: enhance health, attending university by swimming, join in professional team, personal interests, job hunting with the help of swimming, parents’ willing, add scores in school entering, chosen by coaches not voluntary, others. Its statistical results are as TABLE 4.

TABLE 4 : Swimmers’ training motivation

Rank	Option	Frequency	Percentage
5	Enhance health	34	34.70%
4	Attending university by swimming	46	46.90%
3	Join in professional team	51	52.00%
1	Personal interests	58	59.20%
6	Job hunting with the help of swimming	13	13.30%
7	Parents’ willing	12	12.20%
2	Add scores in school entering	52	53.10%
8	Chosen by coaches not voluntary	6	6.10%
9	Others	5	5.10%

Correspond to above analysis, it is clear that swimmers’ training motivation mainly concentrates on enhancing health, it occupies 59.20%, while according to personal interests and joining in swimming team also occupy considerable proportions.

CONCLUSION

The size of the swimming team in expanded year by year, need to strengthen management, to well improve the quality of swimming team reserve talented person. Can see in the for the analysis of the swimming team coach coaches the overall quality is higher, age distribution is reasonable, most of the teaching process in comply with the content of the syllabus. From the above we can see in this a few kinds of Chinese athletic swimming back-up talent management is more reasonable, can satisfy the

Chinese swimming for the supply of reserve talented person. At the same time also hope that the Chinese swimming team in international expectations in the big games, get good grades, return the motherland.

REFERENCES

[1] Zhang Ming-Fei, Chen Yan, Zhang Yi-Hua; China Sport Science and Technology, **42(5)**, 85-88 **(2006)**.
[2] Sun Bing, Xu Hongqi; Journal of Tianjin Institute of Physical Education, **23(5)**, 433-436 **(2008)**.
[3] Li Yi-Yu, Yang Fang, He Jiang-Chuan; Neural Regeneration Research, **13(37)**, 7381-7384 **(2009)**.
[4] Tang Qingwen, Chen Li; Sichuan Journal of Anatomy, **5(2)**, 93-96 **(1997)**.
[5] Ji Gang; Journal of Guangzhou Physical Education Institute, 29(4), **(2009)**.
[6] Luo Zhi; Journal of Chengdu Physical Education Institute, **31(5)**, 93-97 **(2005)**.
[7] Wang Ju-Tao, Miao Miao; Journal of Chengdu Physical Education Institute, **38(4)**, 72-76 **(2012)**.
[8] B.Zhang, S.Zhang, G.Lu; Journal of Chemical and Pharmaceutical Research, **5(9)**, 256-262 **(2013)**.
[9] B.Zhang; International Journal of Applied Mathematics and Statistics, **44(14)**, 422-430 **(2013)**.
[10] B.Zhang, H.Yue; International Journal of Applied Mathematics and Statistics, **40(10)**, 469-476 **(2013)**.
[11] B.Zhang, Y.Feng; International Journal of Applied Mathematics and Statistics, **40(10)**, 136-143 **(2013)**.