Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2014, 6(6):2420-2426

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Fuzzy clustering analysis-based swimming reserve talent cultivation research

Chunfeng Xia

Department of Humanities and Social Sciences, Zhejiang Industry Polytechnic College, Yuecheng District, Shaoxing, Zhejiang, China

---

ABSTRACT

Swimming type sports events are always one of the favorite sports events by men, women-people of ages, in the beginning of China, swimming mainly concentrates on streams, rivers, lakes, and seas so on. With large-scale swimming pool emergency in each city, swimming type sports competitive events have gradually been known by many people, and gradually loved by national people. The paper carries fuzzy clustering analysis of Chinese swimming reserve talent and gets: Chinese swimming team scale is expanding yearly, which needs to strengthen management so that can well improve swimming team reserve talent quality. During analysis of swimming team coaches, it is clear that coaches' overall quality is higher, age distribution is relative reasonable, during coaching process, mostly follow syllabus contents. From above types, we can see that Chinese competitive swimming event reserve talent management is relative reasonable, which can meet supplying of Chinese swimming team reserve talent. And meanwhile it also hopes that Chinese swimming team can meet the expectation and get good results in international large-scale competitions.

Key words: Fuzzy clustering analysis, reserve talent, swimming, mathematical model

---

INTRODUCTION

As one of big gold medal events in Olympic Games, swimming is the key event of international every country's competition. With social progress and science and technology rapidly development, competitive sports events competitions have also grown fiercer, great powers in international put considerable emphasis on swimming development, and China also has no exception. America is acknowledged as power in competitive swimming events in the world, swimming is also big event that America wins the gold medal in Olympic Games, which can well explain swimming events decisive effects on international large-scale competitions. In view of history, Chinese swimming events have both glorious and lows in development process [1-3]. In 1992 Barcelona Olympic Games, its performance is prominent that has achieved four gold medals and five silver medals in swimming events; in 2000 Sydney Olympic Games, it has gained nothing in swimming events; in 2008 Beijing Olympic Games, it has achieved one gold medal, three silver medals and two bronze medals in swimming events [4-6].

With Chinese opening-up and reform as well as economic system deepen reform, planned economy caused some aftereffects always affect and restrict Chinese swimming competitive events reserve talent cultivation and supplying. However, correspond to swimming type reserve talent amount, quality high or low directly affects Chinese swimming type events sustainable development and magnificent target implementation. For a long term, Chinese swimming type event reserve talent mainly relies on "amateur sports school—swimming school、 sports school—sports team" the three grades mode to carry out, the mode obviously cannot adapt to increasingly changed world and better provide high quality swimming type reserve talent amount, the mode has suffered some impact. Therefore, it affects Chinese competitive swimming reserve talent improvement and popularization to some extent [7-10].

Chinese competitive swimming events have got some achievements in recent years, but with yearly Chinese

competitive swimming levels emergency of overall sliding, the causes are because swimming type events excellent reserve talent always cannot be effective supplied so that lead to such kind of temporary shortage, reserve talent serious insufficient phenomenon. Swimming type sports events reserve talent cultivation is a problem that to be urgently solved in competitive sports development, according to Chinese present status, it should focus on swimming reserve talent corresponding echelon construction, only then can Chinese competitive sports development get very far and catch up with international advanced levels.

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 $\underset{-}{R}^{*}$, 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: $M > \max_{i \neq j} \left\{ \sum_{k=1}^{n} x_{ik} x_{jk} \right\}$

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 $0 \leq r_{ij} \leq 1 (i \neq j)$.

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;
②its 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 Fig. 1.

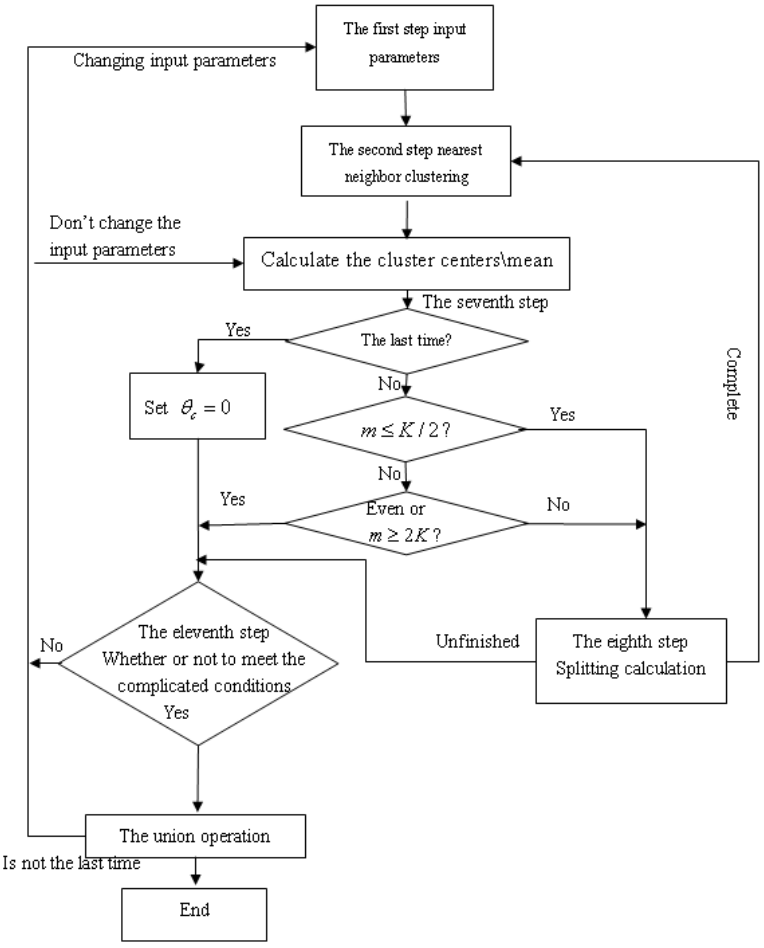

Fig. 1: Hierarchical diagram

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 Fig. 2.

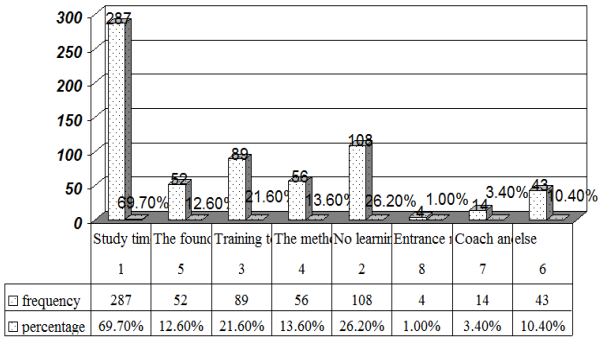

Fig. 2: Swim reserve talents in learning problems

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 Fig. 3.

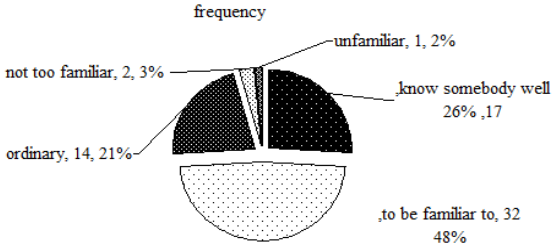

Fig. 3: Swimming trainer to familiar with the situation of "outline"

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 Fig. 4.

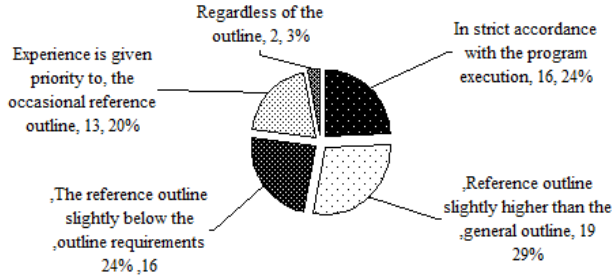

Fig. 4: Swimming trainer to perform the teaching curriculum

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

Swimming team scale is expanding yearly, which needs to strengthen management so that can well improve swimming team reserve talent quality. During analysis of swimming team coaches, it is clear that coaches' overall quality is higher, age distribution is relative reasonable, during coaching process, mostly follow syllabus contents. From above types, we can see that Chinese competitive swimming event reserve talent management is relative reasonable, which can meet supplying of Chinese swimming team reserve talent. And meanwhile it also hopes that Chinese swimming team can meet the expectation, get good results, and serve the motherland in international large-scale competitions.

REFERENCES

[1] ZHANG Ming-fei, CHEN Yan, ZHANG Yi-hua. *China Sport Science and Technology*, **2006**, 42(5), 85-88.
[2] SUN Bing, XU Hongqi. *Journal of Tianjin Institute of Physical Education*, **2008**, 23(5), 433-436.
[3] Li Yi-yu, Yang Fang and He Jiang-chuan. *Neural Regeneration Research*, **2009**, 13(37), 7381-7384.

[4] Tang Qingwen, Chen Li. *Sichuan Journal of Anatomy,* **1997**, 5(2), 93-96.
[5] JI Gang. *Journal of Guangzhou Physical Education Institute*, **2009**, 29(4).
[6] LUO Zhi. *Journal of Chengdu Physical Education Institute*, **2005**, 31(5), 93-97.
[7] WANG Ju-tao, MIAO Miao. *Journal of Chengdu Physical Education Institute*, **2012**, 38(4), 72-76.
[8] Zhang B.; Zhang S.; Lu G.. *Journal of Chemical and Pharmaceutical Research*, **2013**, 5(9), 256-262.
[9] Zhang B.; *International Journal of Applied Mathematics and Statistics*, **2013**, 44(14), 422-430.
[10] Zhang B.; Yue H.. *International Journal of Applied Mathematics and Statistics*, **2013**, 40(10), 469-476.
[11] Zhang B.; Feng Y.. *International Journal of Applied Mathematics and Statistics*, **2013**, 40(10), 136-143.