Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2014, 6(6):276-281

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Club form university physical education mode research under analytic hierarchy process

Zhiqiang Zhao

Inner Mongolia Technical College of Construction, Hohhot, Inner Mongolia, China

---

ABSTRACT

With opening up and reform, introduce foreign advanced system into Chinese sports clubs to face to whole students, expand freedom degree, is fit for Chinese university physical education. According to analytic hierarchy process model, study university physical education mode from entertainment, mental relaxation, physical exercise, safety these four aspects, mainly compare club form university physical education with general teaching way differences to make research. By results, it shows sports club education mode occupies 55.3% while general physical teaching only occupies 24%, non management teaching occupies 29%, thereupon, it can indicate that in university sports teaching mode, club education occupies great proportions.

Key words: analytic hierarchy process, club form, university sports, education form, physical health

---

INTRODUCTION

Club form sports has already had a long history in foreign countries, such as Japan who started late, it has already had higher level development in club sports form management and operation in shortly 40 years, in some western world, club form sports are even supported by broad masses, is also most frequent occurrence place of sports activities, to public, the emergence of club form sports becomes their main body building form. By analyzing, it gets that foreign sports club has non-profit attributes, and club relies on voluntary and public principle to operate. And most of sports clubs have government funding and support.

With Chinese economic growth, opening-up and reform, it introduces foreign advanced systems, researches on Chinese sports clubs are increasing by year, and look for mode and operation method that conforms to Chinese sports clubs features that also lead to lots of scholars' research on it.

Model establishments

Analytic hierarchy process is originated from 1970s that discovered by an American operational research expert, he classified objects relative factors into target layer, criterion layer, scheme layer, and formed into good qualitative and quantitative analysis.

2.1 **Establish hierarchical structure**

The paper based on analytic hierarchy process, it quantizes university physical education. Establish target layer, criterion layer, scheme layer relations.

Target layer: University sports education mode.

Criterion layer: Scheme influence factors, c_1 is entertainment、c_2 is mental relaxation、c_3 is physical exercise、c_4 is safety.

Scheme layer: A_1 is sports club、A_2 is general physical teaching 、A_3 is non-management teaching. It gets hierarchical structure as Figure 1 show:

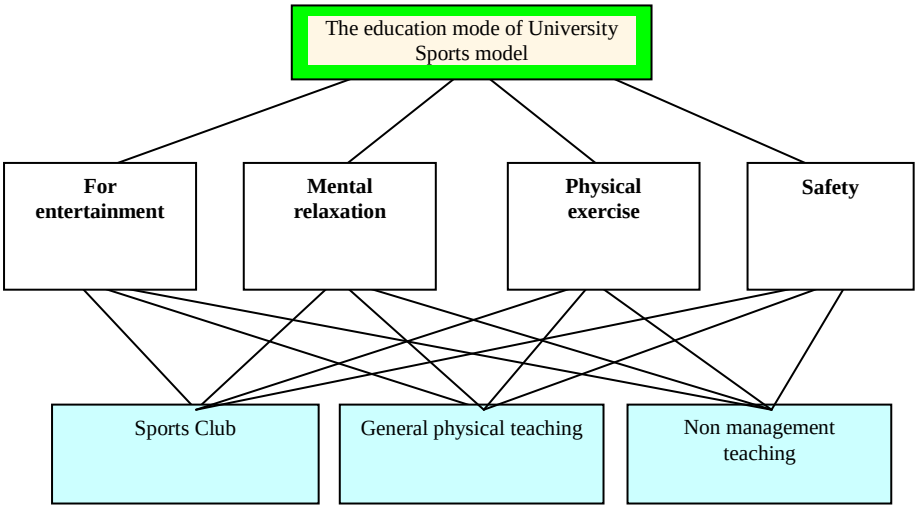

Figure 1: Hierarchical structure

2.3 Construct judgment (paired comparison) matrix

In criterion layer, each criterion target occupies different proportions, by researchers researching on criterion layer, and according to number 1～9 and its reciprocal to judge each criterion target occupied weights.

The paper takes Table 1 showed 1～9 scale table as evidence, it makes weight analysis.

Table 1: 1～9 scale table

Scale a_{ij}	Definition
1	factor i and factor j have equal importance
3	factor i is slightly more important than factor j
5	factor i is relative more important than factor j
7	factor i is extremely more important than factor j
9	factor i is absolute more important than factor j
2,4,6,8	Indicates middle state corresponding scale value of above judgments
Reciprocal	If factor i and factor j are relative weak, obtained judgment is reciprocal

Refer to Figure 2, it is 1～9 scale figure.

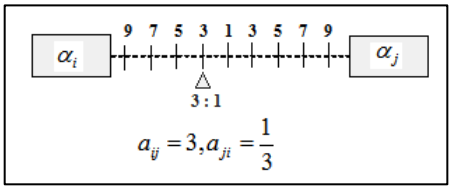

Figure 2: 1～9 scale figure

Table 2: Comparison matrix

G	C_1	C_2	C_3	C_4
C_1	1	1/3	3	3
C_2	31/8	1	5	5
C_3	1/3	1/5	1	1
C_4	1/3	1/5	1	1

At first, solve judgment matrix, according to above principle, reference 1～9 scale setting, and according to experts'

experiences and refer to lots of documents, it gets paired comparison matrix that are respective as Table2-6.

Table 3: Comparison matrix

c_1	A_1	A_2	A_3
A_1	1	1	1/3
A_2	1	1	1/3
A_3	3	3	1

Table 4: Comparison matrix

c_2	A_1	A_2	A_3
A_1	1	5	5
A_2	1/5	1	5
A_3	1/5	1/5	1

Table 5: Comparison matrix

c_3	A_1	A_2	A_3
A_1	1	5	8
A_2	1/5	1	5
A_3	1/8	1/5	1

Table 6: Comparison matrix

c_4	A_1	A_2	A_3
A_1	1	5	8
A_2	1/5	1	5
A_3	1/8	1/5	1

2.4 Hierarchical single arrangement and consistency test

Use consistency indicator to test: Set in comparison matrix, $\lambda_{\max}$ is maximum feature value, n is comparison matrix order: $CI = \frac{\lambda_{\max} - n}{n-1}$

CI Value gets smaller; Judgment matrix gets closer to completely consistent. CI gets bigger shows that known degree is lower.

2.5 Hierarchy total sorting and its consistency test

$$A=\begin{Bmatrix} 1 & 1/3 & 3 & 3 \\ 3 & 1 & 5 & 5 \\ 1/3 & 1/5 & 1 & 1 \\ 1/3 & 1/5 & 1 & 1 \end{Bmatrix}$$

$$\xrightarrow{\text{Column vector normalization}} \begin{Bmatrix} 0.214 & 0.192 & 0.3 & 0.3 \\ 0.075 & 0.577 & 0.5 & 0.5 \\ 0.121 & 0.115 & 0.1 & 0.1 \\ 0.201 & 0.115 & 0.1 & 0.1 \end{Bmatrix}$$

$$\xrightarrow{\text{Solve sum by line}} \begin{Bmatrix} 1.066 \\ 2.22 \\ 0.386 \\ 0.386 \end{Bmatrix}$$

$$\xrightarrow{\text{Normalization}} \begin{Bmatrix} 0.2515 \\ 0.555 \\ 0.0965 \\ 0.0965 \end{Bmatrix} = W^{(0)}$$

$$AW^{(0)}=\begin{Bmatrix} 1 & 1/3 & 3 & 3 \\ 3 & 1 & 5 & 5 \\ 1/3 & 1/5 & 1 & 1 \\ 1/3 & 1/5 & 1 & 1 \end{Bmatrix}\begin{Bmatrix} 0.2514 \\ 0.555 \\ 0.0965 \\ 0.0965 \end{Bmatrix}=\begin{Bmatrix} 1.012 \\ 2.275 \\ 0.387 \\ 0.387 \end{Bmatrix}$$

$$\lambda_{\max}^{(0)}=\frac{1}{4}\left(\frac{1.012}{0.251}+\frac{2.275}{0.555}+\frac{0.387}{0.0965}+\frac{0.387}{0.0965}\right)=4.037$$

$$w^{(0)}=\begin{pmatrix} 0.251 \\ 0.555 \\ 0.097 \\ 0.097 \end{pmatrix}$$

Similarly, it can calculate judgment matrix

$$B_1=\begin{Bmatrix} 1 & 1 & 1/3 \\ 1 & 1 & 1/3 \\ 3 & 3 & 1 \end{Bmatrix}, B_2=\begin{Bmatrix} 1 & 5 & 5 \\ 1/5 & 1 & 5 \\ 1/5 & 1/5 & 1 \end{Bmatrix}, B_3=\begin{Bmatrix} 1 & 5 & 8 \\ 1/5 & 1 & 5 \\ 1/8 & 1/5 & 1 \end{Bmatrix}, B_4=\begin{Bmatrix} 1 & 5 & 8 \\ 1/5 & 1 & 5 \\ 1/8 & 1/5 & 1 \end{Bmatrix}$$

Corresponding maximum feature value and feature vector are successive:

$$\lambda^{(1)}{}_{\max}=3.64, \omega^{(1)}{}_1=\begin{Bmatrix} 0.244 \\ 0.244 \\ 0.512 \end{Bmatrix}$$

$$\lambda^{(2)}{}_{\max}=3.29, \omega^{(1)}{}_2=\begin{Bmatrix} 0.657 \\ 0.251 \\ 0.092 \end{Bmatrix}$$

$$\lambda^{(3)}{}_{\max}=3.31, \omega^{(1)}{}_3=\begin{Bmatrix} 0.648 \\ 0.204 \\ 0.148 \end{Bmatrix}$$

$$\lambda^{(4)}{}_{\max}=3.31, \omega^{(1)}{}_4=\begin{Bmatrix} 0.648 \\ 0.204 \\ 0.148 \end{Bmatrix}$$

Use consistency indicator to test: $CI=\frac{\lambda_{\max}-n}{n-1}$, $CR=\frac{CI}{RI}$

Table 7: RI value

n	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

(1) It gets judgment matrix A, $\lambda^{(0)}_{\max} = 4.073, RI = 0.9$

$$CI = \frac{4.073-4}{4-1} = 0.24$$

$$CR = \frac{CI}{RI} = \frac{0.024}{0.90} = 0.027 < 0.1$$

It shows A inconsistency test is valid and moves within permissible range, it can use A feature vector to replace weight vector.

(2) Similarly, make consistency test on judgment matrix B_1, B_2, B_3, B_4, it gets weight vectors.

Utilize hierarchical chart drawing out calculation results from target layer to scheme layer, as Figure 3 show.

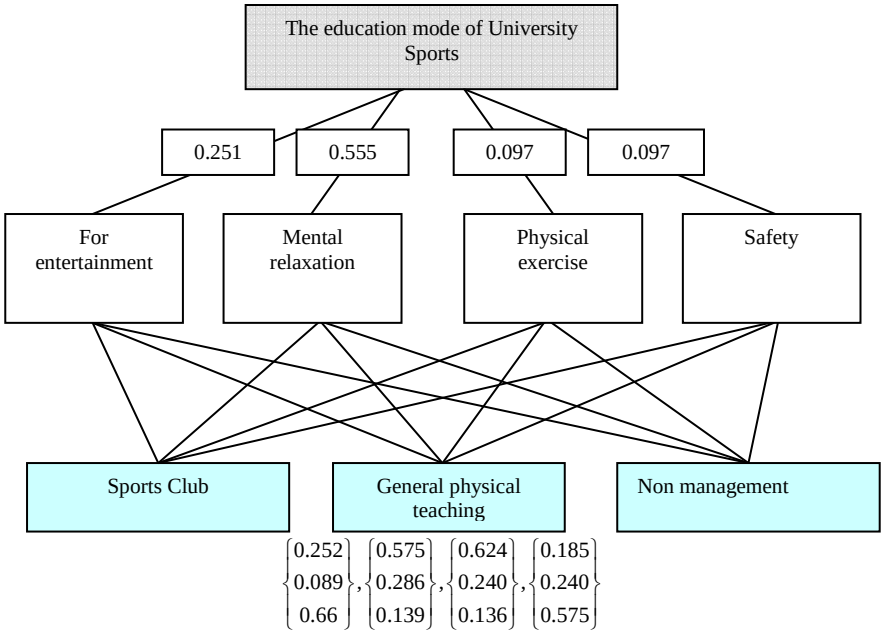

Figure 3: Hierarchical structure chart

Calculation structure as following:

$$\omega^{(1)} = (\omega_1^{(1)}, \omega_2^{(1)}, \omega_3^{(1)}, \omega_3^{(1)})$$

$$= \begin{Bmatrix} 0.624 & 0.185 & 0.252 & 0.575 \\ 0.234 & 0.240 & 0.089 & 0.286 \\ 0.136 & 0.575 & 0.66 & 0.139 \end{Bmatrix}$$

$$w = w^{(1)} w^{(0)}$$

$$= \begin{Bmatrix} 0.252 & 0.575 & 0.624 & 0.185 \\ 0.089 & 0.286 & 0.240 & 0.240 \\ 0.66 & 0.139 & 0.136 & 0.575 \end{Bmatrix} \begin{Bmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{Bmatrix}$$

$$= \begin{Bmatrix} 0.290 \\ 0.157 \\ 0.553 \end{Bmatrix}$$

According to obtained weight, it is clear that sports club education mode occupies 55.3% while general physical teaching only occupies 24%, non management teaching occupies 29%, thereupon, and it can indicate that in university sports teaching mode, club education occupies great proportions.

CONCLUSION

Analytic hierarchy process can dynamic integrate qualitative analysis with quantitative analysis to make multiple targets decision-making analysis, the method can analyze a problem according to its contained all kinds of factors occupied weights, and classifies a problem into different hierarchies and multiple, comprehensive influence factors, by paired factors comparing, it gets comparison matrix. And there are many analytic hierarchy process methods, as fuzzy analytic hierarchy process, grey analytic hierarchy process, improved analytic hierarchy process and so on. The paper studies university physical education mode from entertainment, mental relaxation, physical exercise, safety these four aspects, it gets sports club education mode superiorities.

REFERENCES

[1] WANG Kun, WEI Wen-yi. *China Sport Science*, **2005**, 25(1):42-45.
[2] LI Hong-bo, LIV Hao. *Journal of Sports Adult Education*, **2011**, 27(2):55-57.
[3] Yang Fengjuan. *Journal of Beijing Sport University*, **1998**(4).
[4] Dai Li-Ping. *Fujian Sports Science and Technology*, **2012**, 31(3):27-30.
[5] Shan Xinhai Dai Yusheng Cai Guojun Jin Jichun. *Sports & Science*, **1997**, 18(4):22-26.
[6] Cheng Wan-xiang et al. *Journal of Chengdu Physical Education Institute*, **2010**, 36(3).