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The educational value analysis of university aerobics based on AHP

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ABSTRACT

Aerobics is an essential sporting event in the University education. Since it has various forms and has a rich humanity and entertainment, it is very popular among college students. Aerobics cultivates their own sense of team, aesthetic consciousness and innovation capability while benefiting the athlete's body in the movement. This paper analyzes the aerobics from the four aspects of physical fitness, team spirit, aesthetic ability and innovation capability based on AHP; it obtains that physical education of aerobics accounts for 24% and humanities education accounts for 55.1%, which indicates that for the sport aerobics, humanities education accounts for a large proportion. By analyzing long-distance running and comparing aerobics, it obtains that two sports are different for the educational model. According to the obtained weights, long-distance running accounts for 55.3% of physical education, aerobics accounts for only 24%; long-distance running accounts for 29% of humanistic education, while aerobics accounts for 55.1%, by contrast aerobics is one sport with high humanistic educational meaning.   © 2014 Trade Science Inc. - INDIA

INTRODUCTION

Since the 1990s, humanistic quality education of sports has become an important topic in China. However, as an aerobics cause of humanistic qualities atmosphere, it is still relatively small in our country. For Chinese contemporary college students, the types of university physical education is very small, which leads to the weak practical ability of contemporary college students, and the configuration and education methods of sports courses are very old. So you want to improve the overall quality of college students, healthy and good sports education model is essential. As an exercise of cultural atmosphere aerobics can combine aerobics and physical education of university students, which can not only improve the physical fitness of college students but also can enhance the human qualities of students.

Domestic research indicates that aerobics is an aerobic exercise, can combine the music with the dance, can improve the physical, mental and moral qualities of participants, and especially can develop one's aesthetics standard and values. In 1956, the United Kingdom founded the first aerobics association of Great Britain. United States is also the representative of contemporary aerobics; in 1968, the U.S first included the aerobics training into astronaut workout. Moreover, in the international arena, many developed countries have injected into a lot of research on aerobics.

By analyzing the characteristics and value of the aerobics, people can scientifically and effectively con-

FULL PAPER

duct aerobics workout, thus allowing more people to participate in the ranks of Aerobics, enhancing the whole people's physical fitness, promoting the general health, improving national attainment and spreading sports culture; in turn better promoting the development of aerobics and better serving humanity.

Establish hierarchical structure

Based on hierarchy analysis quantify the aerobics and establish target layer, criterion layer and program layer.

Target layer: the leading physical education.

Criterion layers: Factors of the program, c_1 is the physical fitness, c_2 is a spirit of cooperation, c_3 is the aesthetic judgment, and c_4 is the innovation capabilities.

Program layer: A_1 is the humanistic education, A_2 is the physical education, A_3 is the recreation education and get the hierarchical structure as shown in Figure 1.

Factor analysis

Physical quality

As an Olympic event, aerobics has not only performances significance, but also has a higher demand on its strength and movement. As a usual curriculum of college physical education, Aerobics has good effects for enhancing muscle strength, and with proceed of the movement, raise the athlete's tendons', ligaments' and muscles' elasticity, and thus enhance the body's flexibility.

And aerobics performances generally last longer accompanied by music, and cannot change rhythm and pace at any time according to their own physical fitness. And compared to other sports, the aerobics also requires good physical coordination of athletes, because good physical coordination makes the action coherent and the team neat, which is also key win in the game to.

Spirit of cooperation

In aerobics performances, especially in large game, teamwork is the key factor in achieving excellent results. During training, good cooperation ability can ef-
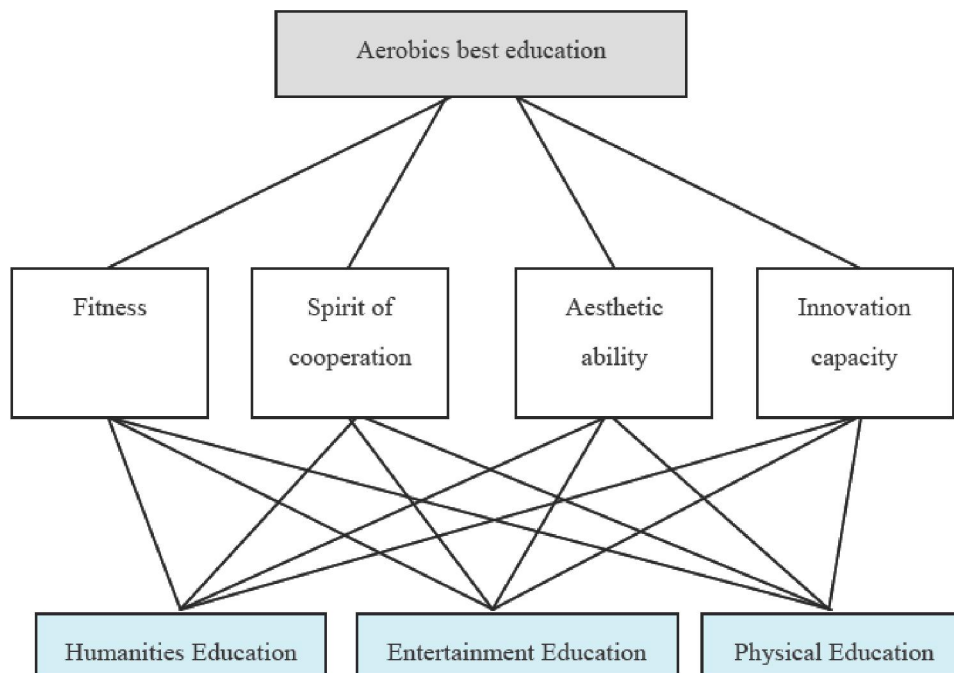

Figure 1 : Hierarchical structure

fectively combine individuals and the overall. First, any player must adapt to the team; in teaching, training teamwork between the players is particularly important; in pacific exercises and assessment, changes of the individual's actions and the formation require the coop-

eration between the players. Also, this team spirit is not manifested temporarily; it requires repeated training during teaching.

Aesthetic ability

In Aerobics performances, the music and dance

BioTechnology
An Indian Journal

FULL PAPER

choreography both test the aesthetic ability of the athletes, and so this paper gives weight values according to aesthetic capacity.

Innovation capacity

Compared to other sports, aerobics athletes in particular need to have the innovation ability, because players need the movement innovation and choreography for a complete segment of aerobics. Therefore, this paper also conducts empowerment.

Construct judgment (pairwise comparison) matrix

Judgment matrix is to express the relative importance degree of each element in each level relative to the element in the above level by the form of so-called matrix element. In order to pairwise compare the various factors and get the quantifiable judgment matrix, introduce the scale of 1~9 as shown in TABLE 1.

The 1~9 scale chart of the judgment matrix is shown in Figure 2.

TABLE 1: The 1~9 scale table of the judgment matrix

| Scale a_{ij}	Definition
1	factors i and j are equally important
3	factor i is slightly important than factor j
5	factors i is more important than factor j
7	factor i is very important than factor j
9	factor i is absolutely important than factor j
2, 4, 6, 8	the scale value corresponding to the intermediate state between the above judgments
reciprocal	If compare factor i and factor j, obtain the value, $a_{ji} = 1/a_{ij}$, $a_{ii} = 1$

$$a_{ij} = 3, a_{ji} = \frac{1}{3}$$
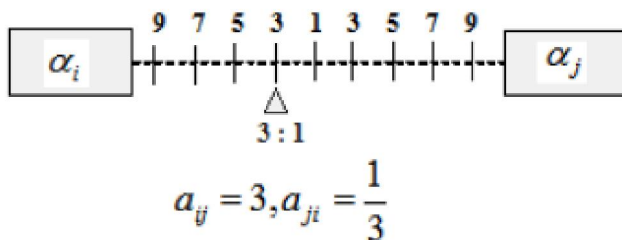
Figure 2 : The 1~9 scale chart of the judgment matrix

First solve the judgment matrix, according to the above principles, refer to the 1~9 scale setting of the judgment matrix, and according to the expert's and the author's experience and extensive literature reference, obtain the pairwise comparison matrices, respectively, TABLE 2, TABLE 3, TABLE 4, TABLE 5 and TABLE 6.

The single-level sorting and consistency test

Conduct test with a consistency index $CI = \frac{\lambda_{max} - n}{n - 1}$, wherein λ_{max} is the maximum eigenvalues of the comparison matrix, n is the order of comparison matrix. The smaller the value CI is, the closer to the complete consistency the judgment matrix is. Conversely, the greater the deviation degree of the

judgment matrix from the complete consistency is.

TABLE 2 : Comparative 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

TABLE 3 : Comparative 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

FULL PAPER

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TABLE 4 : Comparative 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 : Comparative 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 : Comparative 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

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The total level sorting and consistency test

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

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

$$\xrightarrow{\text{Sum row}} \begin{Bmatrix} 1.066 \\ 2.22 \\ 0.386 \\ 0.386 \end{Bmatrix}$$

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

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

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

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

Similarly the judgment matrix can be calculated:

TABLE 7 : Value of RI

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

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

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

The corresponding maximum eigenvalue and eigenvectors are successively as follows:

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

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

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

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

Conduct test with consistency index $CI = \dfrac{\lambda_{max} - n}{n-1}$,

$$CR = \dfrac{CI}{RI}$$

(1) For the judgment matrix A,

$$\lambda^{(0)}{}_{max} = 4.073, RI = 0.9$$

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

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

It means that the inconsistency degree of A is not in the allowable range; at this time we can use the eigen-vector of A to replace the weight vector.

(2) Similarly, the judgment matrix B_1, B_2 B_3 and B_4 all have passed conformance testing by using the above

principles.

Draw the calculation results from the target layer to the program layer by using the hierarchical structure, as shown in Figure 3.

The computation structure is as follows:

$$\omega^{(1)} = (\omega_1^{(1)}, \omega_2^{(1)}, \omega_3^{(1)}, \omega_3^{(1)}) = \begin{Bmatrix} 0.244 & 0.657 & 0.648 & 0.648 \\ 0.244 & 0.251 & 0.204 & 0.204 \\ 0.512 & 0.092 & 0.148 & 0.148 \end{Bmatrix}$$

$$w = w^{(1)} w^{(0)} = \begin{Bmatrix} 0.244 & 0.657 & 0.648 & 0.648 \\ 0.244 & 0.251 & 0.204 & 0.204 \\ 0.512 & 0.092 & 0.148 & 0.148 \end{Bmatrix} \begin{Bmatrix} 0.251 \\ 0.555 \\ 0.097 \\ 0.097 \end{Bmatrix} = \begin{Bmatrix} 0.551 \\ 0.24 \\ 0.21 \end{Bmatrix}$$

MODEL EVALUATION

Based on the above hierarchical analysis models, this paper analyzes the long-distance running and com-pares it with the aerobics movement, shown in Figure 4.
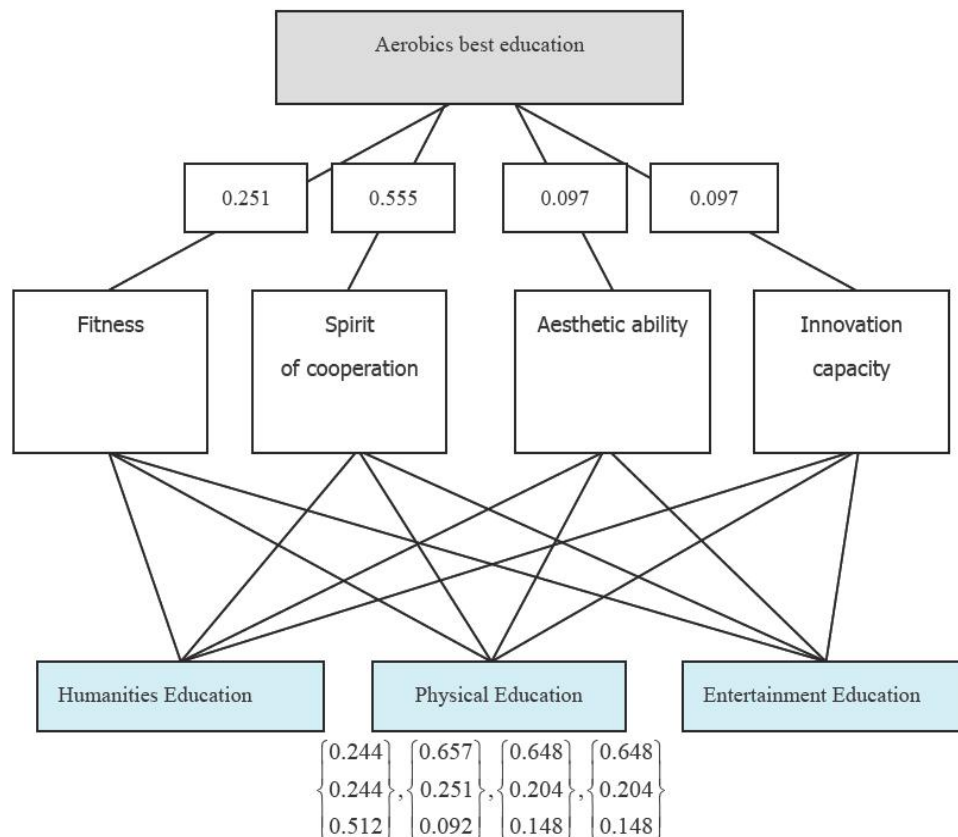
The computation structure is as follows:

Figure 3 : Hierarchical structure diagram
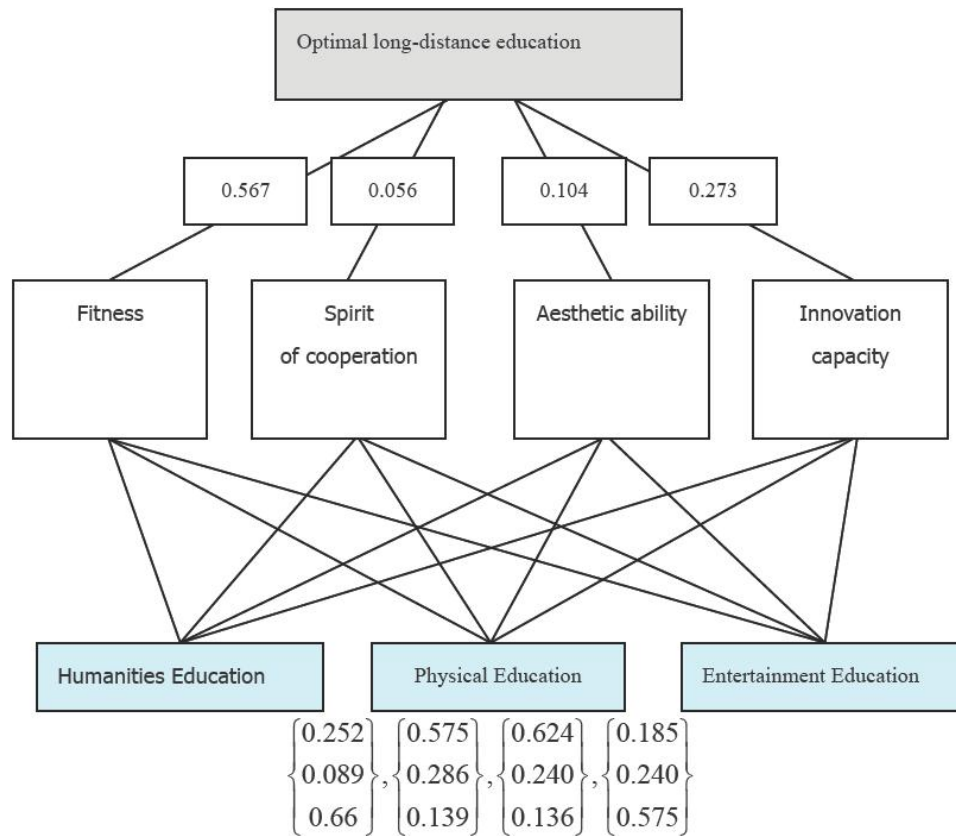
FULL PAPER

Figure 4 : Hierarchical structure diagram

$$\omega^{(1)} = (\omega_1^{(1)}, \omega_2^{(1)}, \omega_3^{(1)}, \omega_4^{(1)})$$

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

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

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

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

According to the obtained weights, long-distance running accounts for 55.3% of physical education, aerobics accounts for only 24%; long-distance running accounts for 29% of humanistic education, while aerobics accounts for 55.1%, by contrast Aerobics is one sport with high humanistic educational meaning.

CONCLUSIONS

Aerobics is an essential sporting event inside the University education. Since it has various forms and has a rich humanity and entertainment, it is very popular among college students. Aerobics not only benefits the athlete's body in the movement, but also develops their own sense of team, aesthetic consciousness and innovation capability. This paper analyzes the aerobics from the four aspects of physical fitness, team spirit, aesthetic ability and innovation capability; it obtains that physical education of aerobics accounts for 24% and humanities education accounts for 55.1%, which indicates that for the sport aerobics, humanities education accounts for a large proportion.

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FULL PAPER

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