Chinese teenager physical health campus organizing cultivation fuzzy comprehensive evaluation

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ABSTRACT

Chinese teenager physique is backbone of Chinese future, only improve teenager physique then can promote civil overall quality, the paper makes fuzzy comprehensive evaluation on Chinese teenager physical health, firstly analyzes main factors: social factor, education factor, management factor and others three aspects factors, and evaluates from campus fitness facilities, school sports staff cultivation, sports course organizing cultivation, and others four aspects. By comprehensive evaluation value, it can get 0.39 that is larger than other each evaluation value, therefore, presently Chinese teenager physical health evaluation is normal that to be further improved and developed.

KEYWORDS

Teenager; Physical health; Fuzzy comprehensive evaluation; Fitness facilities; School physical education.

INTRODUCTION

With the development of global competition, teenager education becomes key factor. However teenagers that immerse in learning, their physique become main issue, with multiplying of such phenomenon, their health status is even worse. Presently, Chinese teenagers physical status don't adapt to teenagers' education, the influence range is expanding by year, Chinese teenagers' physique is facing extremely challenge.

TABLE 1 : Teenager physique influential main factors

Social factor	Education factor	Management factor
Economy	Sports teachers' level	Physical education management organization
Living way	Leaders attention, school physical education safety	Physical education regulations ad system
Family education	School physical education management, sports activities organizing	Physical education health systems
Policy of Only child	Test-oriented education, school sound education	Physical education standards implementation

By TABLE 1, it shows teenager physique influential main factors are social factor, education factor, management factor, and get relative details that belong to each type of factors in these three types of factors, as economic aspect, management aspect and so on. It can also show that to improve teenager physique, it can start from above aspects to analyze and improve.

TABLE 2 : Year 2009 and 2012 Wuhan city shortsighted rate growth

	Average rate of shortsighted%	Year 2009 Wuhan city shortsighted rate %	Year 2012 Wuhan city shortsighted rate %
Primary school	51.17	50.28	54.78
Junior high school	79.23	75.36	81.65
Senior high school	83.75	80.45	92.31

In TABLE 2, it compares and gets year 2009 and 2012 two years' Wuhan city shortsighted rate growth, and with studies increasing, average rate of shortsighted are obviously increasing. From pupil average rate of shortsighted as 51.17%, now teenager shortsighted rate is universal since primary school, the problem is very serious.

TABLE 3 : Obesity rate

	Overweight rate	Obesity rate	Year 2010 Hubei province overweight rate	Year 2010 Hubei province obesity rate
Urban schoolgirl	12.15	1023	12.56	6.97
Urban schoolboy	20.16	18.65	20.36	17.14
Rural schoolgirl	11.34	7.62	11.86	7.45
Rural schoolboy	15.13	15.36	15.36	14.26

By TABLE 3, it can indicate that schoolboy obesity rate is larger than schoolgirl, and rural teenager obesity rate is lower than urban teenager, so proper physical exercises are very important to Chinese modern teenager.

FUZZY EVALUATION MODEL ESTABLISHMENTS

Fuzzy comprehensive evaluation model

Fuzzy comprehensive evaluation model fits for fuzzy computation that multiple factors are uncertain, the paper utilizes fuzzy comprehensive evaluation, and steps are as following:

At first, the paper establishes factor set U :

$$U = \begin{pmatrix} U_1 & U_2 & \cdots & U_k \end{pmatrix}$$

Secondly, establish judgment set V (evaluation set),

The paper establishes evaluation matrix fuzzy mapping from U to V, obtained fuzzy relation as following matrix show :

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

The paper establishes weight set, $A = (a_1, a_2, \cdots, a_n)$, it meets conditions:

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

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

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

Secondly the paper carries on following computation according to fuzzy comprehensive evaluation:

$$B = A \cdot R$$

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

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

In V, fuzzy combination is evaluation set B. To sum up, actually fuzzy comprehensive evaluation obtained multimode system simple change model is as Figure 1 shows:
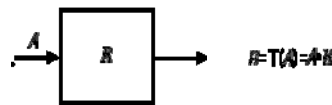

Figure 1 : Simple change model

According to Figure 1 marked contents, it gets fuzzy comprehensive evaluation change model, and can establish corresponding every factor grade evaluation transformation function, evaluation

factors u1, u2, u3, u4, u5 membership functions can be expressed as following formula (1)、(2)、(3) shows:

$$u_{v1}(u_1) = \begin{cases} 0.5(1+\dfrac{u_i-k_1}{u_i-k_2}), & u_i \geq k_1 \\[2mm] 0.5(1-\dfrac{k_1-u_i}{k_1-k_2}), & k_2 \leq u_i < k_1 \\[2mm] 0 \quad , & u_i < k_2 \end{cases} \qquad (1)$$

$$u_{v2}(u_1) = \begin{cases} 0.5(1-\dfrac{u_i-k_1}{u_i-k_2}), & u_i \geq k_1 \\[2mm] 0.5(1+\dfrac{k_1-u_i}{k_1-k_2}), & k_2 \leq u_i < k_1 \\[2mm] 0.5(1-\dfrac{u_i-k_3}{k_2-k_3}), & k_3 \leq u_i < k_2 \\[2mm] 0.5(1-\dfrac{k_3-u_i}{k_2-u_i}), & u_i < k_3 \end{cases} \qquad (2)$$

$$u_{v1}(u_1) = \begin{cases} 0, & u_i \geq k_2 \\[2mm] 0.5(1-\dfrac{k_1-u_i}{k_2-k_3}), & k_3 \leq u_i < k_2 \\[2mm] 0.5(1+\dfrac{k_3-u_i}{k_2-u_i}), & u_i < k_3 \end{cases} \qquad (3)$$

Combine with Fuzzy evaluation model to evaluate

By above model principle established factor set U, among them $U = \begin{pmatrix} U_1 & U_2 & U_3 & U_4 \end{pmatrix}$. Among them, campus fitness facilities U_1, school sports staff cultivation U_2, sports course organizing cultivation U_3, others U_4, it gets TABLE 4. The paper establishes small factors sets in four important factor sets.

TABLE 4 : Chinese teenager physique evaluation indicator system

Campus fitness facilities U_1	school sports staff cultivation U_2	sports course organizing cultivation U_3	Others U_4
Campus facilities introduction u_{11}	Coaches cultivation u_{21}	Sports competition u_{31}	Sports observation and emulation u_{41}
Campus facilities maintenance u_{12}	Teaching and administrative staff cultivation u_{22}	Extracurricular activities u_{32}	Physical education development u_{42}
Competition facilities construction u_{13}	Competition introduction u_{23}	Physical education course lecturing u_{33}	Traditional sports revitalization u_{43}
Daily facilities construction u_{14}	Sports staff cultivation expense u_{24}	Games u_{34}	
Apparatus changing u_{15}			

By TABLE 4 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 factors importance degree ranking statistics as TABLE 5 shows.

TABLE 5 : Four factors importance degree ranking statistics

Classification	Rank 1	Rank 2	Rank 3	Rank 4
Campus fitness facilities U_1	23	7	4	0
School sports staff cultivation U_2	0	0	15	18
Sports course organizing cultivation U_3	0	9	13	12
Others U_4	3	21	9	0

By TABLE 5 sorting, it gets campus fitness facilities U_1, school sports staff cultivation U_2, sports course organizing cultivation U_3, others U_4 four aspects ranking matrixes.

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

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

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

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

Obtained weighted vector from rank 1 to rank 2:

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

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

$U_1^* = 14$, $U_2^* = 9.4$, $U_3^* = 4$, $U_4^* = 5.6$

The paper takes normalization processing:

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

It gets:

$$\bar{A} = \begin{pmatrix} 0.35 & 0.3 & 0.2 & 0.15 \end{pmatrix}$$

The paper establishes remarks membership, as TABLE 6 show.

TABLE 6 : 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

The paper through Chinese teenager physical cultivation obtained evaluation in campus fitness facilities U_1, school sports staff cultivation U_2, sports course organizing cultivation U_3, others U_4 four aspects each indicator, it gets TABLE 7.

TABLE 7 : Chinese teenager physique each indicator obtained evaluation value

Each layer indicator	Evaluation value	Each layer indicator	Evaluation value
Campus facilities introduction u_{11}	Normal	Sports competition u_{31}	Good
Campus facilities maintenance u_{12}	Normal	Extracurricular activities u_{32}	Good
Competition facilities construction u_{13}	Normal	Physical education course lecturing u_{33}	Good
Daily facilities construction u_{14}	Normal	Games u_{34}	Normal
Apparatus changing u_{15}	Normal	Sports observation and emulation u_{41}	Bad
Coaches cultivation u_{21}	Very good	Physical education development u_{42}	Normal
Teaching and administrative staff cultivation u_{22}	Very good	Traditional sports revitalization u_{43}	Normal
Competition introduction u_{23}	Bad		
Sports staff cultivation expense u_{24}	Good		

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

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

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

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

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

By TABLE 5, and combine with TABLE 3 remarks membership, the paper gets campus fitness facilities U_1, school sports staff cultivation U_2, sports course organizing cultivation U_3, others U_4 each aspect evaluation set:

Campus fitness facilities
$$U_1 = \begin{pmatrix} 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0 \\ 0 & 0.05 & 0.95 & 0 \\ 0 & 0.05 & 0.95 & 0 \end{pmatrix}$$

School sports staff cultivation
$$U_2 = \begin{pmatrix} 0.05 & 0.90 & 0.05 & 0 \\ 0.05 & 0.90 & 0.05 & 0 \\ 0 & 0.95 & 0.05 & 0 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

Sports course organizing cultivation
$$U_3 = \begin{pmatrix} 0.05 & 0.95 & 0.05 & 0 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0.05 & 0.9 & 0.05 & 0 \end{pmatrix}$$

Others
$$U_4 = \begin{pmatrix} 0.05 & 0.95 & 0.05 & 0 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

Carry on following computation on above evaluation set:

$$B_i = A_i \cdot R_i$$

Make normalization processing with obtained B_i, it gets fuzzy evaluation matrix.

$$\bar{B} = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} = \begin{pmatrix} 0.07 & 0.26 & 0.13 & 0.42 \\ 0 & 0.15 & 0.76 & 0.54 \\ 0.14 & 0.24 & 0.21 & 0.17 \\ 0.14 & 0.2 & 0.3 & 0.36 \end{pmatrix}$$

It gets comprehensive evaluation value:

$$Z = U^* \cdot B = \begin{pmatrix} 0.16 & 0.24 & 0.39 & 0.21 \end{pmatrix}$$

CONCLUSION

In view of the whole world, the generation of teenager's physical health level, especially for physical ability declination trend is not only just existing in China, but also many countries come across similar status. Especially entering into 50s of the 20th century, teenager physical health level declination problem has gradually become world developed countries joint confronted difficulties, how to strengthen teenager children physical health accordingly becomes world subject. Chinese teenager physical health status recent ten years' accelerated sliding tendency also shows violating phenomenon with Chinese economic development trend, which also should be focused.

By comprehensive evaluation, it can get 0.39 that is larger than other each evaluation value, therefore, presently Chinese teenager physical health evaluation is normal that to be further improved and developed.

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