

Research on evaluation Standard of Physical Literacy ability based on cloud Model

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Abstract. In order to better solve the ambiguity and uncertainty in the evaluation indicators of college students' physical literacy, the cloud model method is used to evaluate college students' physical literacy ability, and the evaluation system is constructed by combining the first and second level indicators such as sports cognition, sports ability and sports behavior. With the cloud theory, the index weight cloud and standard cloud are set up Based on information of each evaluation index and algorithm to get the final evaluation index of cloud, finally compared with the evaluation standard of cloud, determine the advantages and disadvantages of indicators of physical quality evaluation standards can comprehensive scientific assessment of college students' sports literacy ability, found that college students' literacy ability of sports based on cloud model sports ability is good, sports awareness and sports behavior ability needs to be strengthened The method is scientific and the results are more intuitive with the help of evaluation cloud map, which is helpful to improve the research of physical literacy in China.

Keywords: Cloud model, physical literacy, evaluation criterion.

1. Introduction

In recent years, Physical Literacy has gradually become a hot research topic in the field of Physical education at home and abroad. We understand it as the active pursuit of life and health for each individual. At present, the evaluation of school Physical education in China is mainly based on students' Physical health test Physical tests, however, cannot well reflect the quality of school physical education effect Therefore, in urgent need of the new evaluation method to intuitive and comprehensively to evaluate the quality of the school sports education The current domestic external evaluation is one of the important ways of school physical education sports literacy assessment, has been part of the study abroad, but our country the study of sports quality evaluation is still in exploring stage.

Many scholars have conducted researches on sports literacy ability, mostly interpreting foreign sports literacy and constructing the framework system of concept interpretation. Liu Yang and Tang Yan et al. found that it has the coherence of localization index system of concept connotation through interpreting foreign sports literacy As for the framework system model construction, Yu Sumei et al. constructed a domestic sports literacy evaluation system based on foreign studies, which conforms to the socialist core values, embodies the essential characteristics and value functions of sports disciplines, and realizes the sports ontology The mutual promotion and harmonious development of human and society [3-5] were mostly evaluated by mathematical statistical analysis in previous studies, but there were also some different methods. For example, Chen Qi used qualitative and quantitative methods to evaluate, avoiding the subjective ambiguity of evaluation indicators Therefore, this paper adopts the cloud model method proposed by Li Deyi to complete the evaluation of indicator capability, and adopts the forward and reverse cloud generator algorithm to achieve the mutual transformation of qualitative indicators and quantitative data [7-8], so as to complete the comprehensive evaluation

Therefore, this paper uses cloud model method to evaluate sports literacy ability, and constructs a comprehensive evaluation system combining the first and second level indicators, such as sports knowledge, sports behavior and sports cognition. By virtue of cloud theory, index weight cloud and index standard cloud are set up Finally, compared with the evaluation standard cloud, the advantages

and disadvantages of indicators are determined and applied to the evaluation of college students' sports literacy ability, providing reference for the development of sports literacy in China

2. Definition of Key Concepts

In 1993, British scholars of Whitehead, formally put forward the concept of physical education literacy at the International Women's Sports Education and Sports Conference. He believes that "sports literacy is the motivation, confidence, physical ability, understanding and knowledge of an individual to maintain an appropriate level of physical activity throughout his life", which is also an internationally recognized concept.

In China, physical literacy was first put forward by Professor Lai Tiande, who believes that physical literacy refers to the cultural level of sports [10-12] and scholar Yu Zhi believes that, Sports literacy is produced on the basis of innate genetic quality through the influence of the environment and physical education, including the comprehensive sports quality and cultivation of physical fitness level, sports knowledge, sports consciousness, sports behavior, sports skills, sports personality, sports morality and other elements. To sum up, the current interpretation of the concept of physical literacy in China basically focuses on the cultural level of sports.

3. Evaluation index model of physical literacy ability

Student sports literacy ability is the basic index for evaluation of the school sports work, it reflects the effect of school physical education quality About students' sports quality ability evaluation index, both qualitative and quantitative To scientific to evaluate sports core literacy, must deal with the fuzziness and uncertainty evaluation index Cloud model is a mathematical model, it converts qualitative indexes and quantitative numerical three numerical characteristics, expect entropy and hyper entropy $H E E n E x$, fuzziness and uncertainty in comprehensive evaluation of index, find out the category and distribution of quantitative numerical, or quantitative numerical abstraction, qualitative description properly, make the qualitative description and quantitative values corresponding to each other Therefore, the establishment of sports core literacy evaluation model can not only deal with the multi-subject and multi-factor problems in sports core literacy, but also avoid the fuzziness and uncertainty in the evaluation system.

3.1 Evaluation index weight standard cloud is determined

3.1.1 Establish a set of evaluation indicators

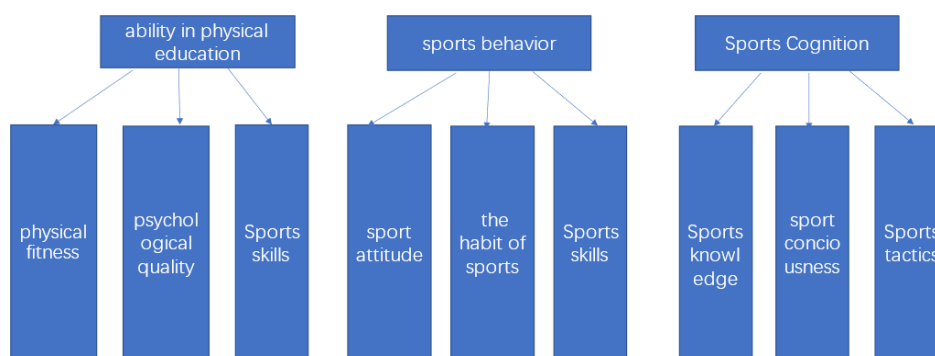


Fig.1 Evaluation index of mine emergency rescue capability

The establishment of evaluation index set is the first step of evaluation. According to the characteristics of sports core literacy, referring to previous research results, through expert survey and questionnaire interview, the evaluation index set $C=(C_1, C_2, \dots, C_n)$, namely, sports behavior, sports ability and sports cognition, 9 secondary indicators, such as physical fitness and sports skills, are selected from numerous evaluation indicators of sports literacy as evaluation

indicators of sports literacy ability , and a secondary evaluation indicator set D=(D1,D2,... D9) is established, as shown in Figure 1.

3.1.2 Determine the evaluation index weight standard cloud

It can be seen from the second-level indicator set that there are both qualitative and quantitative indicators for the evaluation of physical literacy ability. The weight value of each indicator cannot be accurately quantified, but the weight value of the evaluation indicator is extremely important. Therefore, the index weight value A=(A1,A2, The number field of A5) is [0,1]. AP(1 ≤ p ≤ 5), namely the qualitative language value, is selected to represent the importance of the evaluated index. There are five evaluation criteria: Very important is A1, Very important is A2, Relatively important is A3, Unimportant is A4 and Very Unimportant is A5, those are used to indicate the importance of the evaluated indicators and an expert score is given for AP(1 ≤ p ≤ 5) Ri (Ri is the first expert score and 0 ≤ Ri ≤ 1, 1 ≤ i ≤ N), and then the reverse cloud generator algorithm of the cloud model is used to calculate the digital characteristics of AP (ExAp,EnAp,HeAp), that is, to evaluate the initial cloud of index weight.

$$E_{xAp} = \frac{1}{n} \sum_{i=1}^n R_i \tag{1}$$

$$E_{nAp} = \sqrt{\frac{\pi}{2}} \cdot \frac{1}{n} \sum_{i=1}^n |R_i - E_{xAp}| \tag{2}$$

$$H_{eAp} = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (R_i - E_{xAp})^2 - E_{nAp}^2} \tag{3}$$

According to the evaluation index weight initial cloud (ExAp, EnAp, HeAp), the index weight cloud map can be obtained by using the forward cloud generator. If the experts do not reach a consensus, it needs to be repeated several times to gradually reduce the differences and get the final weight standard cloud through statistical calculation: A1 (0.995, 0.064, 0.002), A2 (0.785, 0.055, 0.005), A3 (0.545,0.055,0.005), A4 (0.285,0.055,0.005) and A5 (0.015,0.064,0.002).

3.2 Evaluation indicators standard cloud determination

Table 1. Criteria for evaluation of command and management indicators

Level Indicators	Two grade index	Evaluation criterion	Range
Sport behavior	The habit of sports	The average number of daily steps in a week and the number of MVPA participants per week	(0.86-1.00)
		The average number of daily steps in a week and the number of MVPA participants per week	(0.76-0.85)
		The average number of daily steps in a week and the number of MVPA participants per week	(0.61-0.75)
		The average number of daily steps in a week and the number of MVPA participants per week	(0.00-0.60)
	The sports quality	Fully equipped with the ability to bear hardships, good cooperation, moral performance, sense of responsibility and so on	(0.86-1.00)
		Skilled with the ability to bear hardships, good cooperation excellent quality moral performance sense of responsibility performance	(0.75-0.85)
		Basically have the ability to bear hardships, good cooperation excellent quality moral performance sense of responsibility performance	(0.61-0.75)
		Do not have the ability to bear hardships, good cooperation of excellent quality moral performance performance sense of responsibility	(0.00-0.60)
		Love physical activities, moderate intensity exercise three times a week or more	(0.86-1.00)
		PE attitude	Love physical activity, exercise once or twice a week
I like sports and exercise once every two weeks	(0.61-0.75)		
He doesn't like sports and never plays sports	(0.00-0.60)		

As the evaluation indicators are not all qualitative or quantitative indicators, the author uses qualitative language values to evaluate physical literacy ability. Due to space limitation, this paper only selects some evaluation criteria for indicators, as shown in Table 1. It is assumed that four grades of qualitative language value, i.e., failing, good and excellent, are used to represent the quality of the evaluation index of physical literacy ability, and the number field of each qualitative language value is between [0,1].

The numerical interval of qualitative language values is set as [Kmin,Kmax],Kmin represents the minimum value under bilateral constraints, and Kmax represents the maximum value under bilateral constraints. All qualitative language values are interpreted based on normal cloud, that is, the cloud digital characteristics of the cloud model are

$$Ex = \frac{Kmin+Kmax}{2}; \quad En = \frac{Kmax-Kmin}{6}; \quad He = \alpha \quad (4)$$

Among them, α is a constant whose size is adjusted by comments. On the basis of expert consultation and questionnaire survey, the numerical distribution range of the four evaluation levels and their cloud digital characteristics are determined to obtain the evaluation index standard cloud (Table 2). The normal standard cloud of the evaluation level is shown in Figure 2.

Table 2. Numerical distribution ranges and cloud digital features of evaluation levels

Range	Distribution range	Cloud digital features
The Initial Level	0.00-0.60	(0.600,0.158,0.003)
Evolution period	0.35-0.85	(0.750,0.083,0.005)
To complete the level	0.80-0.95	(0.850,0.042,0.005)
Superior level	0.85-1.00	(1.000,0.067,0.003)

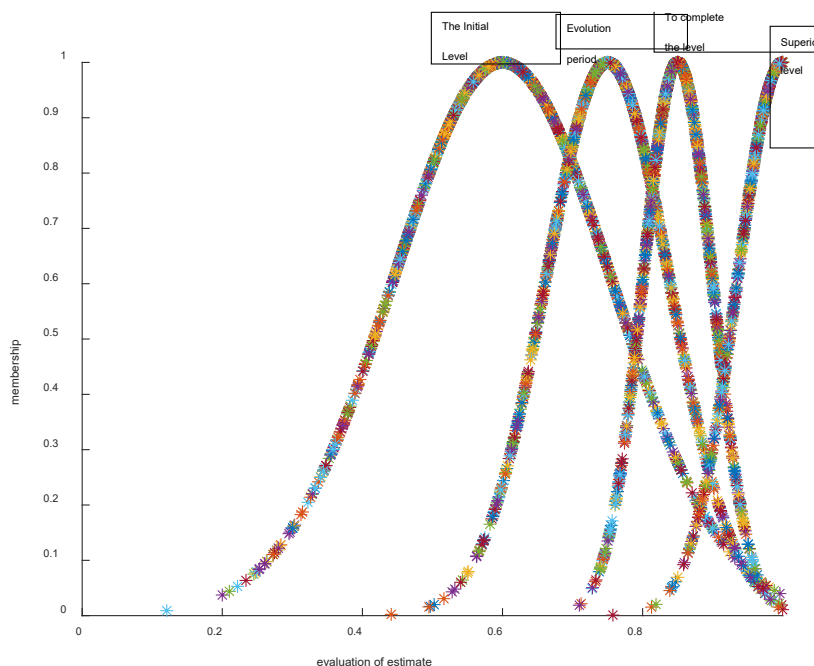


Fig.2 Evaluation standard cloud of indexes

3.3 Physical literacy ability assessment

The evaluation of physical literacy ability refers to the evaluation cloud of each secondary index by making the evaluation value of each secondary index against the evaluation standard cloud of the index according to the individual physical literacy ability. Then, with the help of the weight cloud of each indicator and cloud computing rules, the evaluation cloud of each first-level indicator of sports literacy ability is obtained. Finally, the superior indicators are evaluated by comparing the evaluation cloud and the evaluation standard cloud.

(1) Determine evaluation indicators to evaluate the cloud

It can be seen from the above that the first-level evaluation indicator set is $C=(C1,C2, \dots Cy,1\leq y\leq 3)$, and the second-level evaluation indicator set is $D=(D1,D2,\dots D9)$ the evaluation value of the second-level index is determined by experts' scoring. H experts and scholars are selected to score the second-level index. Then, for the evaluation index $DfCy$ (the f -th index of the second-level index Df of physical literacy ability, $1\leq y\leq 3, 1\leq f\leq 9$) H evaluation values. The digital features of $DfCy$ are firstly obtained by using the reverse cloud generator algorithm, and then an evaluation cloud map is created by using the forward cloud generator. Evaluate the clutter degree of cloud droplets on the cloud map according to $DfCy$, and gradually control the scoring of experts until experts have a consistent understanding and get the second-level indicators to finally evaluate cloud $DfCy(Ex(DfCy), En(DfCy), He(DfCy))$.

(2) Determine the evaluation cloud of physical literacy ability

According to the final evaluation cloud of the secondary evaluation index $DfCy$, the final evaluation cloud of Cy of each primary indicator of physical literacy ability was obtained. At the same time, the evaluation cloud $Cy(ExCy,EnCy,HeCy)$ of the first-level indicator Cy of a student's physical literacy ability can be obtained by using the cloud computing rule combined with the indicator weight cloud.

$$Cy(E_{xCy}, E_{nCy}, H_{eCy}) = \frac{\sum_{f=1}^9 DfCy \cdot A_{DfCy}}{\sum_{f=1}^9 A_{DfCy}} \tag{5}$$

Where, A_{DfCy} represents the weight cloud corresponding to $DfCy$ evaluation cloud.

(3) Sports literacy ability index optimization

Compare the evaluation cloud Df of each level indicator of physical literacy ability with the evaluation standard cloud, judge the position of Df in the standard cloud (i.e. the evaluation level) and select the dominant indicators.

4. Empirical research

4.1 Research subject

This paper choose China university of mining & technology (Beijing) of the ordinary university students as research object, for a single test object, in addition to the average daily number of daily behavior part project, the rest can test the completed within 60 min Therefore, in addition to the test steps of daily this project, the entire test to adjust as the number of the test object.

(1) Determine the indicator weight cloud

After investigation, experts believe that physical quality, psychological quality, sports skills, sports quality, sports awareness, sports attitude, sports habits, sports tactics, sports knowledge is generally important, that is, the weight of each ability of sports literacy is $D1, D2, D3, D6, D8$ (0.900, 0.058, 0.003), $D4, D5$ (0.850, 0.040, 0.005), $D7, D9$ (0.800, 0.083, 0.005).

(2) Computing metrics to evaluate the cloud

Based on the actual situation of the tested students, 8 experts scored the 9 evaluation indicators according to the evaluation value distribution interval in Table 1 (Table 3). Based on the score of physical quality $D1C1$, equations (1)~(3), namely reverse cloud generator algorithm, were used to calculate the initial evaluation cloud of $D1C1$ (0.836, 0.091, 0.052), and then the evaluation cloud map of $D1C1$ was generated with the help of forward cloud generator, as shown in FIG. 3. It can be seen from FIG. 3 that the confusion degree of cloud droplets is relatively concentrated, indicating that experts have formed a consensus Therefore, $D1C1$ final evaluation cloud (0.836, 0.091, 0.052)

(3) Computing evaluation criteria evaluate the cloud

After calculating the final evaluation cloud of each indicator and the corresponding weight cloud (Table 4), formula (5) And cloud computing rules, the evaluation cloud $C1$ (0.870, 0.030, 0.003) of sports ability index is obtained. Similarly, the evaluation cloud of other first-level indicators is $C2$ (0.849, 0.025, 0.005) and $C3$ (0.835, 0.042, 0.003).

Table 3. Expert scoring table of indexes about kailuan team

	Assessment Expert No.							
	1	2	3	4	5	6	7	8
D1	0.85	0.90	0.82	0.91	0.80	0.89	0.75	0.77
D2	0.80	0.75	0.84	0.81	0.70	0.86	0.73	0.83
D3	0.75	0.80	0.82	0.87	0.78	0.90	0.79	0.76
D4	0.94	0.93	0.89	0.92	0.73	0.90	0.82	0.91
D5	0.87	0.95	0.94	0.90	0.89	0.89	0.92	0.94
...
...
D9	0.78	0.86	0.82	0.85	0.90	0.76	0.79	0.83

Table 4. Final evaluation cloud of each evaluation index of Kailuan team

Evaluation indicators	The weight of cloud	Final evaluation cloud
D1	(0.900,0.058,0.003)	(0.836,0.091,0.052)
D2	(0.900,0.058,0.003)	(0.843,0.025,0.005)
D3	(0.900,0.058,0.003)	(0.890,0.034,0.005)
D4	(0.850,0.040,0.005)	(0.838,0.017,0.005)
D5	(0.850,0.040,0.005)	(0.846,0.026,0.005)
D6	(0.900,0.058,0.003)	(0.853,0.030,0.005)
D7	(0.800,0.083,0.005)	(0.793,0.023,0.005)
D8	(0.900,0.058,0.003)	(0.828,0.036,0.005)
D9	(0.800,0.083,0.005)	(0.851,0.034,0.005)

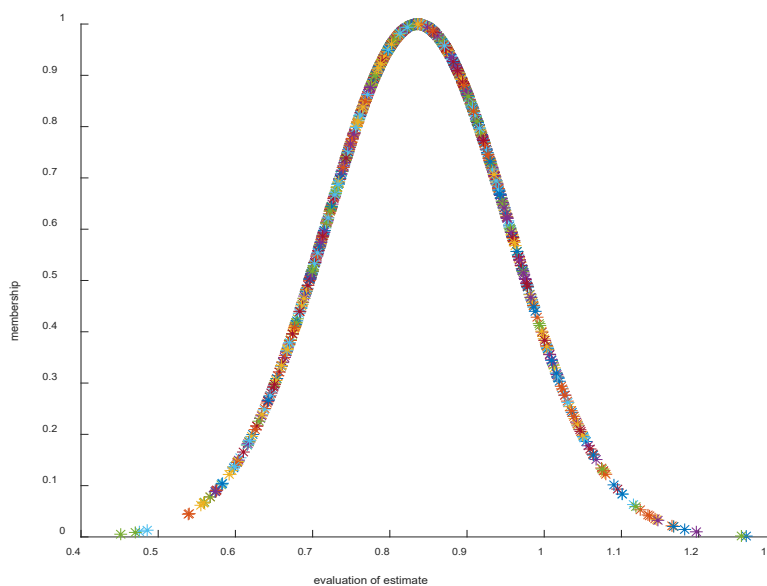


Fig.3 Normality evaluation cloud of **D1C1**

(4) identify strength indicator capability

By comparing the evaluation cloud of each level indicator with the evaluation standard cloud, it is concluded that $C1 > C2 > C3$, so the dominant indicator capability is C1.

4.2 Analysis of empirical results

(1) From the research, it can be seen that: on the whole, the C1 index evaluation cloud of the tested students is in the interval between completion level and superior level, and tends to superior level; C2 and C3 indexes evaluate that the cloud is in the range of completion level and development level and tends to development level.

(2) The subjects of each evaluation index evaluation class cloud compared with the evaluation standard of cloud, you can see almost all sports ability index is superior to the sports behavior and

indicators. This shows that: the classmate of only pay attention to the sports ability of a single, lack of sports cognition behavior such as ability, suggested that college students' ability to maintain its sports, strengthen the sports cognition Sports behavior and other abilities, improve personal sports literacy ability level.

5. Summary

(1) In order to better solve the fuzziness and uncertainty of evaluation indicators in sports literacy ability, based on the characteristics of sports literacy, students' sports literacy ability was evaluated by cloud model, index weight standard cloud and evaluation standard cloud were determined, and the evaluation cloud model of sports literacy ability was constructed.

(2) Compared with traditional evaluation methods, qualitative evaluation method based on cloud model has stronger applicability. Therefore, such comprehensive evaluation method will be the direction of urgent research in the next step.

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