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Implementation Effect of Sunshine Sports in Universities Based on Fuzzy Comprehensive Evaluation

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ABSTRACT

This article aims to apply the fuzzy comprehensive evaluation method to evaluate the effectiveness of implementing sunshine sports in universities. This method is based on fuzzy mathematics and multivariate statistical theory, which can comprehensively consider multiple factors and achieve a comprehensive evaluation of the evaluation object through mathematical models. The article first introduces the background and significance of Sunshine Sports in universities and then elaborates on the basic principle and implementation steps of the fuzzy comprehensive evaluation method. On this basis, the article applies the fuzzy comprehensive evaluation method to analyze the implementation effect of Sunshine Sports in a certain university, including determining the weight of evaluation indicators, establishing a fuzzy evaluation matrix, conducting fuzzy operations, and obtaining comprehensive evaluation results. Finally, the article summarizes the advantages and existing problems of the fuzzy comprehensive evaluation method in evaluating the implementation effect of Sunshine Sports in universities and puts forward corresponding suggestions and prospects.

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1. Introduction

The physical examination of students from 2000-2013 shows that the physical fitness of college students in China has declined continuously. In recent years, our country has been actively carrying out sunshine sports activities, and various universities have combined the activities carried out by the school to evaluate this activity [1]. Every school that promotes sunshine sports has chosen different methods. The sunshine sports chosen by some schools can include aerobics and winter long-distance running activities, and a comprehensive model of activity month is also conducted. There is no corresponding system and hierarchy for

assessing these activities [2]. For the examination standard of sunshine sports, most schools aim to assess the participation of school teachers and students in extracurricular activities. In this way, it is very difficult to find the right scale when checking the sunshine sports activities, and this assessment will also result in unfairness caused by human factors [3]. The real situation of teachers and students in sports activities can't be reflected fairly and objectively, and it also can't help students strengthen their understanding of physical education. The development of sunshine sports has not achieved practical results, and naturally, it can't improve and strengthen the physical health of young people. It is far from achieving the overall level of physical education in schools with the help of Sunshine Sports. At the same time, students are not encouraged to participate extensively in sports activities [4].

2. The State of the Art

For the theoretical research results of fuzzy mathematics, the fuzzy mathematics foundation and practical algorithm published by Li Hongji and the practical decision-making method, analytic hierarchy process published by Xu Shubai. These works have deeply analysed the fuzzy comprehensive evaluation method and discussed the related concepts and characteristics of the method in detail. The detailed implementation process has been introduced. The most commonly used methods in establishing the evaluation system are the analytic hierarchy process and fuzzy comprehensive evaluation. These two methods have achieved scientific and effective evaluation [5]. In the research of fuzzy comprehensive evaluation of sunshine sports in colleges and universities, the index system of sunshine sports will be established through factor analysis, analytic hierarchy process (AHP) and grey relational coefficient method. Through these specific indicators for the weight analysis, the effectiveness of the discriminant method is evaluated [6]. According to the analysis and interpretation of the above literature, from the content of the study, it can be found that the research done by predecessors is mainly based on these aspects: most studies do not have real cases. They are judged by the theory so that the construction of the evaluation system of sunshine sports activities can't be truly solved. On the other hand, these studies are carried out from a macro point of view, and there is no specific research on specific areas, which does not reflect the differences caused by sunshine sports. Moreover, in the previous articles, most of them use the same method in constructing the evaluation system, and there are many experiments without judging methods, which leads to unscientific conclusions and evaluations [7].

3. Methodology

As the continuation and development of extracurricular sports activities, the successful establishment of an evaluation system can help schools to carry out extracurricular sports activities at a deeper level. At the same time, the specific circumstances of students in participating in school sports activities can be determined [8]. In establishing the evaluation system, it is necessary to be by the law of physical development, and this practice of sunshine sports activities is to strengthen the physical exercise of young people. In constructing the evaluation system, a systematic and scientific evaluation of the effect of implementing sunshine sports activities in colleges and universities will be made according to the following principles. The evaluation index will provide references for the teaching work to improve the campus sunshine sports activities in Yunnan province. The objectivity principle of the reference opinions will be ensured [9]. Figure 1 shows sunshine sports.

The definition of fuzzy evaluation means that things have multiple attributes or are made up of a number of indicators, and a variety of reasons will determine the overall quality of things. For these reasons, a more reasonable comprehensive evaluation can be obtained [10]. The index set (*U*), the judgment set (V) and the judgment matrix *R* constitute the fuzzy comprehensive evaluation evaluation model. If an index set U=(X_1 X_2.....X_n) and a judgment set V=(*y1.y2.....yn*) are known[11]. The weight of each index is the fuzzy subset A of the index set and A=(*a1, a2.....an*). *ai* represents the weights of the i indicator, and at the same time, it should meet the condition of $\Sigma^n_{i=1}$ ai = 1. If the fuzzy relation between U and V is the judgment of *i* indicator. Therefore: $R_i(r_{i1}, r_{i2}.....r_{im})$ can complete the establishment of a judgment matrix with *n* indexes:

Finally, the resulting synthetic judgment is the sum of A and R, represented by *B* = *AoR*= (*B*1,

*B*2, *bn*). A fuzzy set on V is represented by B, which refers to the result of the judging activity [12].

Figure 1. Sunshine sports activities

$$R = \left(r_{ij}\right)_{nm} = \begin{Bmatrix} r_{11}, & r_{12} & .... & r_{1m} \\ r_{21}, & r_{22} & .... & r_{2m} \\ .... & .... & .... & .... \\ r_{n1}, & r_{n2} & .... & r_{nm} \end{Bmatrix} \quad (1)$$

Relational composition operations are represented by o. In the process of fuzzy evaluation, the maximum - minimum type $\Delta = (\wedge \vee)$, and the maximum - product type $\Delta = (\bullet \vee)$ and weighted mean $\Delta = (\bullet \oplus)$ can be used for composition operation. The research object of this thesis is sunshine sports, which is a form of student spontaneous participation under the guidance of teachers, and this incident will be affected by many factors [13]. To make full use of the existing conditions of the school, in this study, the weighted average is chosen as the synthetic calculation method to evaluate the effect of this method. The general process of fuzzy comprehensive evaluation is shown in Figure 2.

The establishment of the fuzzy set of the sunshine sports examination system should first complete the single-level evaluation of the factors that are involved [14]. The results obtained again will get a multi-level comprehensive evaluation. The evaluation process is as follows: the first step is to determine the index of the primary factor layer of A = (B1, B2.....Bn), then, the corresponding weight set at this time is A = (*a*1, *a*2, ...*an*), n = 1, 2.....*n*, and the proportion of *Bn* in *A* is represented by n. Next, the determination of the sub-factor-level index set is completed:

Bn= (*Cp.Cp.....Cp*), and the corresponding weight set is F=(*ap, ap, ... ap*), and *n* = 1, 2.. *m* indicates the proportion of the index *Cki* in *Ck*. Finally, a comment set is set up, and the comment set is F= (*F1, F2,.... Fn*), and Fi (*i=1, 2 ...n*).

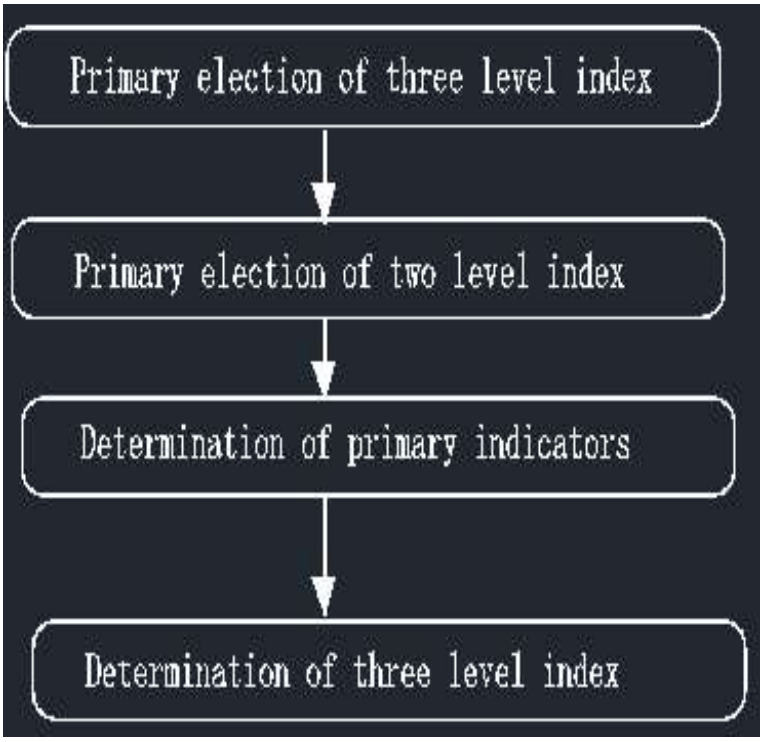

Figure 2. Fuzzy evaluation process

Through the calculation of the fuzzy matrix, the evaluation matrix *Uki* of the sub-factor-level index is obtained. The final evaluation result is expressed by Bk.

$B_k = A_k \bullet R_k = (b_{k1}, b_{k2} \ldots\ldots, b_{kn})$ is written as:

$$R = \begin{bmatrix} B_1 \\ B_2 \\ \ldots. \\ B_n \end{bmatrix} = \begin{bmatrix} b_{11}, & b_{21}, & \ldots. & b_{1m} \\ b_{21}, & b_{22} & \ldots. & b_{2m} \\ \ldots. & \ldots. & \ldots. & \ldots. \\ b_{n1} & b_{n2} & \ldots. & b_{nm} \end{bmatrix} \quad (2)$$

Then, through the operation of the fuzzy matrix on R, the target-layer index U can be obtained, which belongs to the vector B of the comment set F.

$$B = A \bullet R = (a_1, \ a_2 \ldots . a_m) \bullet \begin{bmatrix} B_1 \\ B_2 \\ \ldots \\ B_n \end{bmatrix} = (b_1, \ b_2 \ldots . b_n) \quad (3)$$

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The membership vector B is further normalized to obtain the membership vector: $B = (b_1 b_2 ... b_n)$.

To verify the evaluation effect of the evaluation system indicators in this study, after the specific application of the evaluation index system, the practical results of implementing sunshine sports activities are achieved [15]. Only in this way can reasonable suggestions be made for developing sunshine sports. This chapter uses the evaluation index system established in the preceding paper to conduct a field survey of Kunming University of Science and Technology in Yunnan. Given the sunshine sports activities carried out by schools, the fuzzy comprehensive evaluation method is used to give relevant evaluation. The following shows the evaluation steps for the implementation of physical education in a university. Firstly, the evaluation factor set is established, and by the evaluation system set up in the preceding paper, the evaluation factors of sunshine sports in schools in Yunnan province are represented by A= (B1, B2, B3, B4, B5} = {a comprehensive evaluation of the school's teaching hardware and extracurricular sports as well as the testing of the student's physical qualities}. By different classification standards of the second-level indicator and third-level indicator in the evaluation system, further decomposition is made: B1={it mainly includes policy formulation and appropriate content as well as student cognition}; B2={curriculum setting, teaching content and teaching effect}; B3={sports fund, venue, facility, sports equipment, teaching staff}; B4={the content of sports activities carried out by the school, the participation of students in various sports clubs and sports activities and the effect of morning exercises, etc.}; B5={the management of students' physical fitness test and the standard of achievement}. Next, a set of criteria is needed to complete the design of scales and labels. There are two different forms of scale: qualitative nature and quantitative nature. By the evaluation system for the assessment target of sunshine sports schedules, the scale will choose a qualitative nature so as to make a more intuitive expression of the final assessment results. The judgment set is F= {F1, F2, F3, F4} = (excellent, good and passed}, and these grades are divided into different cores. Among them, the specific score of the excellent set is 95; 75 stands for a good set; 65 and 45, respectively, represent the passing and bad scores in the grade. Through the evaluation system indicators, the evaluation of sunshine sports is completed, and the final factor set for the evaluation of sunshine sports is the third-level index. Therefore, this empirical study investigates the effect of implementing sunshine sports in Kunming University of Science and Technology. Observation, interview, and questionnaire surveys are used in the study. When the data is collected and arranged, the fuzzy evaluation matrix is established to calculate the final score of the effect. The grading of sunshine sports in schools is achieved to provide the school with advice on implementing sunshine sports. Table 1 represents the effect evaluation system and related evaluation methods for implementing sunshine sports.

4. Results and Discussion

Through Kunming University of Science and Technology, a comprehensive evaluation of the implementation effect of sunshine sports in colleges and universities was conducted. The first step was to complete the design of the questionnaire and examine its reliability and validity. The validity of the questionnaire was tested through the expert test method. The validity of the questionnaire is shown in Table 2. In this paper, the retesting reliability method was used as a test method, and 10 teachers and leaders of Kunming University of Science and Technology and 30 students were chosen. In the second week after the first interview, the reliability of the questionnaire was tested by retesting the reliability method, and the value of the r Pearson correlation coefficient was calculated to be 0.63. It is enough for this value to show that the results of these two questionnaires have a strong correlation, which has a good reliability of questionnaire survey. When calculating the evaluation results of the second-level indicators, 250 college students and 50 leading teachers were randomly selected to complete the relevant investigation and interview of the third-level indicators. In all the returned questionnaires, the number of invalid questionnaires was 25, and the questionnaires had an effective rate of 88%. Data statistics show that each grade of the second-level indicators is systematically evaluated according to the survey results collected from the teachers and students, and the evaluation results are shown in Table 2. Table 3 shows the organizational evaluation matrix.

First Level Index	Second Level Index	Third Level Index
B1Organization & Publicity	B11 Organization	C111 Attention paid by leaders C112 Sunshine Sports Group
	B12Policy Formulation	C121 Sunshine sports management mechanism (supervision and reward)
	B13 Publicity Content	C131 Sports humanistic spirit C132 To improve the students' physical quality C133 Enrich students' extracurricular sports activities
	B14Propaganda Form	C141 Columns, banners, posters C142 Broadcasting station, network C143 Courses, lectures and others
	B15Student Awareness	C151 Attitude toward Sunshine Sports C152 An understanding of Sunny Sports C153 Active participation
B2Physical Education	B21Curriculum Setting	C211 Total class hour of physical education course C212 Project opening C213 Students' satisfaction with curriculum
	B22Content Of Courses	C221 Interesting teaching content C222 The course is reasonable C223 The guiding role of teaching contents in extracurricular sports activities
	B23Teaching Effectiveness	C231 Students actively participate in teaching interaction C232 Students are physically and mentally trained C233 Students have the basic motor skills
	B31Sports Funds	C311 Sunshine Sports Fund Allocation C312 Input of special funds C313 Construction of high-level sports teams
	B32Facilities Of The Venue	C321 School sports stadium student area C322 Venue opening degree C323 Meet the needs of teaching
	B33Sports Equipment	C331 Meet the needs of the event
	B34Teaching Staff	C341 Physical education teacher troop C342 Physical education teacher education level C343 Are there any professional instructors in extracurricular sports activities?
B3 Hardware Guarantee	B41Contents Of Sports Activities Carried Out By Schools	C411 Sports competition C412 Daily extracurricular sports activities C413 Intramural sports culture festival and school-

		level individual sport event C414 Department and class sports competition C415 Characteristic sports
B4Extracurricular Sports Activities	B42Sports Clubs	C421 Individual event training C422 A sports organization in a club C423 Students spontaneously organize activities
	B43Student Participation	C431 Participation content C432 Participation form C433 Participation time C434 Participation frequency
	B44Inter-University Sports Activities	C441 Sports Culture Week or cultural festival C442 All sports, individual events, etc. C443 The interaction between sports clubs and clubs
	B45School Morning Exercises & Effect	C451 Students' cognition of morning exercises C452 Management mechanism of students' morning exercise C453 Attendance of students in morning exercises
B5Student Physique Test Compliance Rate	B51Physical Fitness Test Management	C511 Students' cognition of physical fitness test C512 Policymaking for physical fitness testing C513 Physical fitness test equipment C514 Response plan
	B52Student Physique Test Compliance Rate	C521 Student body function test qualified C522 Students' test scores qualified rate

Table 1. Sunshine sports implementation effect evaluation system evaluation method

Questionnaire type	Appraiser	Well	More appropriate	Basically appropriate	Inappropriate	Very inappropriate
Leadership or teacher questionnaire	10	2	4	4	0	0
	Rate	20%	40%	40%	0	0
Student questionnaire	10	3	5	2	0	0
	Rate	30%	50%	20%	0	0

Table 2. Questionnaire content validity expert test results list

The results of the evaluation of "organizational structure" (B11) are:

$$B11 = A11 \bullet R11 = (0.75 \quad 0.248) \bullet \begin{bmatrix} 0.11 & 0.78 & 0.23 & 0 \\ 0.16 & 0.16 & 0.16 & 0 \end{bmatrix} = \begin{pmatrix} 0.478 & 0.45 & 0.211 & 0 \end{pmatrix} \quad (4)$$

Similarly, the evaluation results can be used to calculate the related evaluation of "policy formulation" (B12).

B12=A12 and R12= (C0 0 0.156) are taken as the result. If B13 is taken as publicity, the evaluation result is B13=A13*R13= (0.116 0.116 0.116 0.637). The result of the evaluation of publicity form (B14) is B14=A14.R1! = (0.165 0.165 0.165 0.478).

The evaluation result of student awareness (B15) is: B15=A15.R15= (0.179 0.384 0.534 0.102); the evaluation result of the curriculum setting (B21) is: B21=A21.R21= (0.238 0.238 0.238 0.113); the evaluation result of teaching content (B22) is: B22=A22.R22= (0.465 0.4C 3 0.08 60.071); the evaluation result of teaching effectiveness (B23) is: B23=A23.R23= (0.385 0.341 0.233 0.103); the evaluation result of sports funds (B31) is: B31=A31.R31= (0.138 0.224); the evaluation result of venue facilities (B32) is: B32=A32.R32=(0.738 0.2 46 0.170 0.095); the evaluation result of sports equipment (B33) is: B33=A33.R33= (0.054 0.097 0.263 0.087); the evaluation result of teaching staffs (B34) is: B3 =A34.R3 = (0.127 0.127 0.127 0.560); the evaluation result of the content of sports activities carried out by schools (B41) is: B(1=A(1.R41= (0.166 0.208 0.202 0.316); the evaluation result of sports associations and club sports activities (B42) is: B42=A42.R42= (0.211 0.211 0.211 0.94); the evaluation result of students' participation status (B43) is: B43=A43.R43= (0.209 0.459 0.248 0.142; the evaluation result of the intercollegiate sports activities (B44) is: B4 4=A4 4.R4 4= (0.098 0.09 80.098 0.194); the evaluation result of school morning exercises (B45) is: B :5=A 5.R !5= (0.113 0.01 0.01 0.302); the evaluation result of physical fitness test management (B51) is: B51=A51.R51= (0.139 0.164 0.164 0.143); the evaluation result of student's physical test compliance rate (B52) is: B52=A52.R52=(0.16 0.16 0.16). The evaluation result of the first-grade index can be deduced step by step according to the second-level index, and the comprehensive evaluation result of organizational and appropriate biography (B1) is:

$$B1 = A21 \bullet R21 \bullet \begin{bmatrix} B11 \\ B12 \\ B13 \\ B14 \\ B15 \end{bmatrix} = \begin{pmatrix} 0.311 & 0.311 & 0.056 & 0.061 & 0.061 \end{pmatrix} \quad (5)$$

$$\bullet \begin{bmatrix} 0.478 & 0.454 & 0.211 & 0 \\ 0 & 0 & 0 & 0.156 \\ 0.116 & 0.116 & 0.116 & 0.637 \\ 0.179 & 0.384 & 0.534 & 0.102 \end{bmatrix} = \begin{pmatrix} 0.176 & 0.18 & 0.115 & 0.12 \end{pmatrix}$$

Similarly, the comprehensive evaluation result of physical education (B2) is:

$$B2 = A22 \bullet R22 \bullet \begin{bmatrix} B21 \\ B22 \\ B23 \end{bmatrix} = \begin{pmatrix} 0.33 & 0.304 & 0.192 & 0.098 \end{pmatrix} \quad (6)$$

The comprehensive evaluation result of the hardware support system (B3) is:

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$$B3 = A23 \bullet R23 \begin{bmatrix} B31 \\ B32 \\ B33 \\ B34 \end{bmatrix} = (0.183 \quad 0.163 \quad 0.105 \quad 0.212) \tag{7}$$

The comprehensive evaluation result of extracurricular sports activities (B4) is:

$$B4 = A24 \bullet R24 \begin{bmatrix} B41 \\ B42 \\ B43 \\ B44 \\ B45 \end{bmatrix} = (0.17 \quad 0.205 \quad 0.168 \quad 0.382) \tag{8}$$

The comprehensive evaluation result of the student's physical test compliance rate (B5) is:

$$B5 = A25 \bullet R25 \begin{bmatrix} B51 \\ B52 \end{bmatrix} = (0.063 \quad 0.065 \quad 0.065 \quad 0.009) \tag{9}$$

The reason for calculating a comprehensive evaluation of "sunshine sports" implementation is that the rating effect can be reflected more directly. Through constructing an evaluation system in this research, the implementation of sunshine sports in schools is evaluated objectively. The established evaluation set of V= {excellent, good, bad, extremely bad} represents different levels of standards, and different grades also correspond to different scores. Then, the final score obtained by Kunming University of Science and Technology in the process of sunshine sports is:

To analyze the situation of the implementation of sunshine sports activities in the school fully, according to the comment set, the second-grade indexes included in the evaluation system of sunshine sports are scored accordingly, and the specific circumstances of sunshine sports activities in schools are carried out. In the module work of developing sunshine sports activities of Kunming University of Science and Technology, the scoring results are as follows: the score of the institutional framework is 93.175; the score of policy formulation is 7.02; the score of publicity content is 55.925; the score of appropriate form is 60.285; the score of student awareness is 85.105; the score of the course setting is 61.015; the score of the content of the course is 83.18; the score of evaluation of teaching effectiveness is 81.93; the score of sports funds and venue facilities is 20.43 and 98.94 respectively; the score of sports equipment is 33.415; the score of the proportion of teaching staffs is 55.045; the score of the school's sports activities is 58.72; the score of student participation is 76.79; the intercollegiate score is 91.885; the score of physical exercise during break is 28.575; the score of physical fitness test management and test compliance is 42.6 and 37.6respectively.

$$B \bullet F = \diamond (0.177 \quad 0.189 \quad 0.447 \quad 0.236) \bullet \begin{matrix} 95 \\ 75 \\ 65 \\ 45 \end{matrix} = 70.665 \tag{10}$$

5. Conclusions

Through the empirical analysis of the development of sunshine sports in Kunming University of Science and Technology, the evaluation method is based on the evaluation system established in the research of this paper. The specific investigation methods include questionnaire survey, on-the-spot observation, and interview. And in the final link, teachers

and students are also given acorresponding scoring in the form of questionnaires, and through the fuzzy comprehensive evaluation, it deals with the corresponding scoring and gets the final evaluation score of 70.665 points, which is in line with the passing grade of the reviews. According to the relevant analysis of the empirical research, it can be found that Kunming University of Science and Technology is poor in basic conditions, and at the same time, the lack of a sound supervision and reward mechanism makes no significant effects on the implementation of the sunshine sports activities. The established effect evaluation system for the implementation of sunshine sports activities can be based on the purposes and requirements of the activities and the status, and the fuzzy comprehensive evaluation method can be used to make a comprehensive evaluation of these activities. The evaluation result is scientific and objective, and the application value of this research is more prominent.

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