

Research on the Reform Model of Chinese College Students' Physique Comprehensive Evaluation

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Abstract. Design a new comprehensive evaluation of students' physique improved model, which highlights the inner link of body mass index, vital capacity weight index and body speed, dexterity, strength, endurance. The comprehensive evaluation method helps students improve their physical shape and function through physical exercise, and better body shape and functional advantages are conducive to improving physical quality and sports level.

1. The Proposal of the Problem

1.1 The Necessity of Establishing a Relative Comprehensive Evaluation Method for Students' Physique

In all previous studies on students' physique in China, the results of physical performance and motor quality of 7~23 years old students are increased with age. Under normal circumstances, the height, weight and vital capacity index of human body function often have great influence on the speed, strength, jumping, dexterity and endurance performance of physical quality. For example, in the same age group with different body weight index and height, students with high stature tend to have more natural performance in running, jumping and throwing than those with short stature, but the evaluation of the sports quality of the same age and same-sex students is measured by the same standard. This makes the tall college students who do not need too much exercise or better grasp the basic sports skills can meet the standard. But short stature students use a lot of time to learn sports skills and take part in physical exercise can not get an ideal score. This method of evaluate the physical of students of the same age with the same standard in a relatively irrational way. In this research of evaluation of students' physique, a comparative standard of peer evaluation among similar groups is established. The commonly used methods of scholars at home and abroad are: establish morphological and functional derived indicators by means of a certain mathematical formula, Body shape, body function index.

The "national student physical health standard" in the application of the BMI index (weight [kg]/height [m]²)^[1] can reflect the students' body length and weight, "the study on the investigation of physique and health of students in the application of China Ktole index (weight [kg]/ height [cm] ×1000) can reflect the students' nutritional enrichment relative degree (vital capacity [ml] / weight [kg] index can reflect the students' vital capacity per kg of body weight distribution^[2], and also established a standard of the relative body shape function evaluation for individual students of the same age. In order to establish a relative evaluation method between body shape function and physical quality indicators, some scholars have studied the regression grading method with the influence of students' height and weight index on physical fitness. For example, the nine grade scoring method of height distance[cm] and standing long jump performance [cm]; the nine grade scoring method of weight distance [kg] and shot put score [cm], etc.

1.2 Difficulties in Establishing a Comprehensive Evaluation Method of Physical Fitness Among Individual Students

In the early twenty-first century, sports and health education were carried out in Chinese schools. The guiding ideology of teaching "emphasizes health first". The teaching practice also advocates happy and interest sports. In 2002, the Ministry of Education issued the "student physical health standard (Trial Program)" issued by the State Sports General Administration of China, the physical health index standards were low, which led to the general decline of physical fitness of our school

students^[4]. In response to this problem, the Ministry of education revised the latest national standard for physical health in 2014 which leading our school sports education in the embodiment of fitness, science, effectiveness and acceptability of new ideas. In order to reflect the acceptability of all the students, and not to achieve the same low qualification evaluation index for all students, the effectiveness of it should be the same relative evaluation criteria among all the students, such as the body shape BMI index (weight [kg]/ height [m]²), body function (vital capacity [ml] / body weight [kg]) index, and so on.

The current "national students' physical health standard" and "Chinese student physique and health survey" system are evaluated by the same standard for each age student's body element level. How to establish a comprehensive evaluation method of relative physical form, physical function and physical quality among individuals is still an important research topic for physical educators.

2. An overview of the Design of Chinese Students' Physique Comprehensive Evaluation

2.1 An Initial Model of a Comprehensive Assessment of the Basic Physical and Athletic Abilities of the Body

Comprehensive evaluation of physique is a method of screening and utilizing a number of effective indicators that can reflect physical fitness, athletic ability, and comprehensively evaluate the physical status of human body. The factors which reflect the physical quality of the body are explosive force, speed, flexibility, sensitivity, and endurance. In the long-term study of physique, people have realized that body height, weight and cardiopulmonary function have a direct influence on the performance of various physical qualities. So the selection of evaluation indexes, height, weight, vital capacity index is required. The index of body quality screening can be determined by different evaluation objects and objective conditions. Methods of comprehensive evaluation of students' physique is the earliest Chinese scholar Chen Jinsong in the early 60s of physical education, it is an experimental method of physical examination^[3]. It is a method of comprehensive evaluation of the basic physical and athletic ability of the body by using a number of effective indexes. It makes a $\bar{x} \pm S$ statistic for the test index which selected by the same age sample. The $\bar{x} + 2S$ value is regarded as the top grade. The $\bar{x} + S$ value is selected as the middle and upper level; the \bar{x} value is fixed as the middle; the $\bar{x} - S$ value is the middle and the lower; the $\bar{x} - 2S$ value is the lowest. And in each semester, the data of physical fitness indicators such as height, weight and vital capacity of each student and physical fitness indicators such as 50 meter run, standing long jump and 800 meter run were labeled on the student's body and motor skills. Such as table1.

Table 1 comprehensive evaluation of first grade female students in a university

Grade	height(cm)	50-meter (s)	weight(kg)	long jump(cm)	vital capacity [ml]	800-meter (s)
first-rate $\bar{x} + 2S$	167.3	7.7	52.8	195.2	3023	183.0
fully good middling $\bar{x} + S$	162.2	8.3	57.6	181.5	2687	209.8
Middle $\bar{x} \pm S$	157.7	8.9	52.4	167.6	2351	236.6
below average $\bar{x} - S$	152.9	9.5	47.2	153.8	2015	263.4
low-grade $\bar{x} - 2S$	148.1	10.1	42	140.0	1679	290.2

In Table 1, two lines mark the physical and sports skills of a female college student in a freshman grade. The full line shows that the height of the student is in the middle and upper level, and the

body weight develops at the middle and lower levels, and slender, cardiopulmonary function are poor. The dotted line shows that hypoplasia influence the students' body shape function, the speed, jumping ability and endurance are in the middle and lower level. According to the status of the physical and sports skills in the student's control table, the corresponding exercise prescription can be prescribed.

Table 1 selected samples directly measured the physical index of statistics for the implementation of the five grade evaluation criteria, the sample individual in the overall data is qualitative. The physical and functional development of a person is restricted by factors such as heredity and living environment. This restriction has a direct influence on the performance of physical quality. Therefore, the evaluation results of Table 1 to the individual are objectively qualitative evaluation, which can not reflect the students' individual through physical learning to enhance the physical exercise results.

2.2 Improvement of the Evaluation Model of Body Shape Function and Physical Ability

After the 1980s, as our government institutionalized the work of "student physique and health survey", teachers have further research ideas for quantitative evaluation of students' physique. Body derived index such as the Ktole index: $\text{weight (kg)} / \text{height (CM)} \times 1000$; chest circumference index: $\text{Bust (CM)} / \text{height (CM)} \times 100$; thigh circumference index: $\text{thigh circumference (CM)} / \text{height (CM)} \times 100$; arm circumference index: $\text{arm circumference (CM)} / \text{height (CM)} \times 100$; vital capacity / body weight index: $\text{vital capacity (Ml)} / \text{body weight (kg)}$ etc. This is a further objective relative comparison between the indexes of the physical form and physical function of students in the same group^[4]. It can also reflect the achievement of the student's individual by strengthening physical exercise to improve the physique. There is a quantitative comparability of the data that the individual shows in the sample. However, the performance of the students' sports quality is still qualitatively evaluated, which can not reflect the relative level of the students. The design of the control table is shown in Table 2.

Table2 A comprehensive evaluation of female college students in Career Academy

Grade	Ktole index	100 m(s)	bust/height	shot put	thigh circumference/height	800m(s)	upperarm circumference/height	Sit ups [times]	vital capacity [ml]/weight (kg)	long jump[cm]
A	384	15.5	52	6.9	31	180	15.4	40	68	186
B	352	16.5	51	6.7	30.5	200	15.1	35	59	178
C	330	17.5	50	5.3	30	220	14.8	30	50	170
D	303	18.5	49	4.5	29.5	240	14.5	25	41	162
E	276	19.5	48	3.7	29	260	14.2	20	32	154

The solid line represents body shape and function index curve, and the dashed line represents the curve of motor skill level. According to the present situation of body and motor skills in the student's comparative table, the corresponding exercise prescription can be prescribed. The various morphological and functional indices of Table 2 were used to establish a comparative condition for each student to compare the physical and functional development of the body. The table was divided into five grades and nine grades. But the size of a person's body shape index also restricts the performance of physical competence. Objectively, the larger the index is, the higher the physical level is.

Therefore, the evaluation results of Table 2 for the individual are objectively difficult to reflect the proper combination of physical and physical development and the development of sports quality. Because of too many testing items, it can not be used with the testing project of Chinese students' physical health standard, and it is difficult to apply it.

3. New Method on the Design of Chinese College Students' Physique Comprehensive Evaluation

3.1 The Overall System Design Ideas

(1)After entering twenty-first Century, in order to encourage all students actively monitor their own physical development status, the researchers take into appropriate exercise to improve their body shape, body function and the prime development in sports activities, the majority of PE teachers have accumulated research results to explore the comprehensive evaluation method on students' physique, which to achieve comprehensive and balanced development goals. On the basis of previous studies, we made an improved experiment on the comprehensive evaluation of students' physique and set up a comparative table of physical fitness among college students. The status quo of College Students' physique status is discussed in this paper.

(2) 226 female college students were select and the quality test include: body shape and function index: height (cm), weight (kg), vital capacity (mL). Body shape function index: body weight (kg) / height (CM) x 1000 index, vital capacity (mL) / body weight (kg) index. Physical fitness indicators: 50m run (s), sit-ups (times / min), sitting forward (cm), standing long jump (cm), 800m run (s).

(3) SPSS17.0 software was used to analyze the data of various physical fitness indicators, and the derived indexes of the combination of body shape and function index and physical fitness indicators are: Ktole index / 50 meters running [S]; Ktole index / standing long jump [cm]; Kettley index / sit-up [times]; vital capacity body mass index / 800 meters running [S].

(4)Select the physical form of body weight (kg) / height (CM) × 1000 derivative index ,and physical quality of speed, jumping power quality, flexion flexibility and body function vital capacity / weight index and endurance of the body, the establishment of comprehensive evaluation of physical fitness of College Students' body shape and physical function relation table.

3.2 Develop Comprehensive Evaluation Table

Using the test data of students' physical health standard, the statistical index of comprehensive evaluation of College Students' physical condition was formulated and screened (Table 3).

Table3 Statistical data on physical fitness index of 19~22 year old female college students(n=226)

index	Testing statistical indicators $\bar{x} \pm S$	Physique derived index	statistical result of Physique derived index $\bar{x} \pm S$
1.weight[kg]	54.03±4.73	8.weight[kg]/height[cm]×1000	333.74±32.36
2.height[cm]	161.79±4.73	9. vital capacity [m1]/weight[kg]	49.7±6.1
3. vital capacity [[m1]	2716.50±440.15	10.weight-height index/50meter[S]	35.9±4.9
4.50-meter[s]	9.37±0.87	11. weight-height index /long jump[cm]	1.99±0.5
5.long jump[cm]	169.79±4.73	12. weight-height index / Sit ups [times]	12.6±4.3
6. Sit ups [times]	28.72±10.25	13. vital capacity –weight index/800meter[s]	0.21±0.04
7.800-meter[S](fe male)	242.29±17.94		

3.3 Establishment of a Comparative Table Model of Female College Students' Body Shape Function and Sports Ability

Table 4 comprehensive evaluation of 19~22 year old female college students

Grade	Ktole index/ 50-meter[s]	Ktole index/ Long jump[cm]	Ktole index/ Sit ups [times]	vital capacity [ml] / weight[kg]	vital capacity-weight index /800-meter[s]
first-rate $\bar{x} + 2S$	45.7	0.99	4.0	61.9	0.29
fully good middle $\bar{x} + S$	40.8	1.49	8.3	55.8	0.25
Middle $\bar{x} \pm S$	35.9±4.9	1.99±0.5	12.6±1.3	49.7±6.1	0.21±0.04
below average $\bar{x} - S$	31.0	2.49	16.9	43.6	0.17
low-grade $\bar{x} - 2S$	26.1	2.99	21.2	37.5	0.13

Note: Ktole index=weight[kg]/height[cm]×1000

(1)The solid line in Figure 4 reflects the position of a female college student in morphological development, height, body mass index and body speed, jumping dexterity, and waist and abdominal muscle strength and quality index. The dotted line reflects the position of the derivation index of the ventilator energy index and endurance quality of the female college students in the group.

(2)From the solid line in Figure 4, we can see that the height and weight development ratio of is more suitable for their speed, quality, 50 meter run and jump dexterity. And the influence of the strength of the waist and abdominal muscles on the quality of the sit ups are lower, which in middle grade.

(3)From the dotted line in Figure 4, we can see that the vital capacity / body mass index is at a moderate level, and has a relative level impact on its endurance quality and 800 meter run, which at a middle level.

3.4 Exercise Prescription

(1)It is suggested that college students should take part in swimming and aerobics to improve the level of ventilator and enhance the ability of aerobic endurance.

(2)The fitness exercises of the strength and flexibility of the waist and abdomen are constantly carried out to develop the body shape and structure of flexible .

3.5 The Characteristics of the New Model of Comprehensive Evaluation of Students' Physique

(1)The Ktole index selected in the new evaluation table can reflect the proportionality of body height-weight. When the proportionality of body height-weight and muscle fat is suitable, it has an appropriate effect on body speed, strength and flexibility. When the ratio of height-weight and muscle fat is not suitable (fat ratio is too large, malnutrition, weak muscle fiber), it has a negative impact on the body's physical fitness.

(2)When the the ratio of Ktole index and derived quality of the measurement unit of time is set up for evaluation , the more appropriate the proportion of height to weight development, the speed

of all kinds of exercise is relatively low. The greater the derivative index, the higher the evaluation grade. The inverse ratio of Ktole index and derived measurement unit of distance and frequency is set up for evaluation, the more suitable for the proportion of height and weight development, the distance to complete various sports is relatively long, and the number of movements in the unit of the same time is relatively large, so the smaller the derivative index, the higher the evaluation grade.

(3)The spirogram / body mass index (BMI) used in the new evaluation table reflects the lung capacity per kilogram of body weight distribution, and the level of respirator energy has a great influence on the endurance quality.

(4)The ratio of vital capacity to body mass index and endurance quality as an evaluation grade, the bigger vital capacity weight index, the better oxygen endurance^[5], and the less time to complete the same distance with running, so the greater the derivative index, the higher the evaluation grade.

4. Conclusion

On the basis of previous research, comprehensive evaluation of students' physique improved design table model, using test data of students' physical health standard, the design highlights the inner link of body mass index, vital capacity weight index and body speed, dexterity, strength and endurance of the school health index. The comprehensive evaluation method helps students improve their physical shape and function through physical exercise. Good body shape and functional advantages are conducive to improving physical quality and sports level.

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