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Research Article

Analysis of Physical Fitness Evaluation System for Weightlifters Based on Analytic Hierarchy Process

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As China has repeatedly achieved excellent results in world-class sports events, the country attaches great importance to sports training, among which weightlifting is an advantageous sports event in China. Physical fitness is also the main sports ability to evaluate the function of weightlifters, which has a direct impact on their competitive ability in sports competition. However, there are some problems in evaluating the physical fitness of weightlifters, such as unclear indicators and unclear weight. Therefore, this paper establishes the physical fitness evaluation system of weightlifters based on the analytic hierarchy process and evaluates the physical fitness of weightlifters from three aspects: body shape, body function, and sports quality. In addition, it briefly introduces the calculation process of the analytic hierarchy process, analyzes the constituent factors of weightlifters' physical fitness, defines the indexes of weightlifters' physical fitness evaluation system, and calculates the weight of each index. This study performed many experiments by selecting 10 weightlifters to substitute the relevant data into the evaluation index system and analyzed the body shape of weightlifters. In addition, the results showed that the highest blood testosterone was 926.7 ud/dl, with a score of 95 points, and the lowest was 690.3 ud/dl, with a score of 65 points. The results also show that the highest high snatch with score 95 is 123 kg and the lowest high snatch with score 60 is 98 kg. According to the above research results, the overall physical fitness of Chinese weightlifters is high.

1. Introduction

Weightlifting has recently become a popular competitive sport wherein participants must lift one of the most weights possible in the grab and clean and pull. In competitions, every lift is attempted 3 times, and the maximum weight carried for every pull is added to decide the winner [1]. Weightlifting activities and their adaptations have become a popular training paradigm for improving physical qualities that support success in a variety of sports [2], owing primarily to the high strength and size expressions throughout the motions [3]. The volume of force produced and the ability to do a certain amount of work as quickly as feasible are frequently proposed as major underlying aspects of sports talents such as leaping, running, and changing of orientation activities [4–6]. As a result, many athletic development programs prioritize the development of strength, energy, and quickness. Moreover, because lower muscle strength, higher strength imbalances, and slow sprinting speeds are linked with an increased incidence of muscle strain [7, 8], gains in strength, strength, and quickness are frequently desired to assist decrease the chance of injury.

Recent meta-analyses on the effects of weightlifting exercise on jump performance [9] suggest for this sort of training as it is an excellent training paradigm to increase vertical leap efficiency, which is most typically measured by jump height. Numerous researches have shown robust connections between loading and motion speed, including load-velocity specific assessments of power attributes [10]. As a result, evaluating jump performance only offers a measure of force output or power attributes under lower load and high-velocity conditions. The greater power productions and pace of force generation are indicated in weightlifting motions [11], as well as the motor control and coordination demands placed on the trunk as well as lower body musculature to stabilize and transfer forces [12]. It can have a significant impact on different aspects of an athlete's load-velocity profile and support the growth of a range of physical attributes throughout the strength and power spectrum [13]. Unfortunately, existing meta-analyses have exclusively focused on the impact of WLT on vertical jump, with no meta-analyses giving complete estimates of the impact of WLT on measurements of strength, energy, and speed. As a result, the combined effects of WLT on physical ability over the load-velocity spectrum remain unknown.

In addition to the above, the body sports ability of weightlifters is expressed by physical fitness, which directly determines their competitive ability and performance in the competition [14]. The physical fitness of weightlifters in China is uneven. Some nonprofessionals have poor physical fitness, and professional weightlifters also have different kg classes. Therefore, when evaluating weightlifters, a fixed index cannot be used for judgment, and the problem of inaccurate physical evaluation often occurs. This makes some weightlifters with strong physical fitness unable to participate in high-level sports competitions. Facing this problem, this paper establishes the physical fitness evaluation system of weightlifters based on the analytic hierarchy process and selects multiple indexes related to the physical fitness of weightlifters for evaluation [15]. We set the matching standard, maximum, and lowest values for each index. We evaluate the index values of weightlifters, bring the obtained values into the system, calculate the index weight and overall weight, and judge the actual physical fitness of weightlifters according to the set standards, to accurately judge the physical fitness of weightlifters of different kg classes.

1.1. Innovations of This Paper. The main innovations of this paper are as follows: (1) This paper deeply introduces the operation process based on the analytic hierarchy process (AHP), constructs the index judgment matrix of weightlifters according to this process, and tests the consistency of the indexes. (2) This paper analyzes the constituent factors of weightlifters' physical fitness, takes it as an important index for selecting weightlifters' physical fitness evaluation, and determines the body shape, body function, and sports quality as the first-class index in the system. Finally, it establishes the weightlifters' physical fitness evaluation system based on analytic hierarchy process.

1.2. Organization of the Paper. The rest of our work is organized as follows: Section 2 describes the related work of other scholars, Section 3 presents the overview of the analytic hierarchy process, and Section 4 is based on our proposed evaluation system of weightlifters' physical fitness based on the analytic hierarchy process, the analysis, and results of physical performance evaluation of weightlifters presented in Section 5. Finally, our work is concluded in Section 6.

2. Related Work

Weightlifting is a global sports event, which has the main research focus of a large number of scholars at home and abroad. Due to its importance and popularity, many scholars worked to evaluate the physical function and physiological characteristics of weightlifters. In addition, some have analyzed many factors affecting athletes' physical fitness by constructing a physical fitness model, training weightlifters with pertinence, and purposed to significantly improve their physical fitness [14]. In this regard, the work of [15] has compared the competition performance from the relationship between athletes' vertical jump height, anaerobic strength, isokinetic muscle strength, trunk muscle strength, grip strength, and other factors. It clarifies the prediction factors of male teenagers' weightlifting competition performance. The early work of [16] is based on his ten-year training experience. In this work, the authors have taken long-distance runners and weightlifters as the main objects and studied the effects of delayed exercise on musculoskeletal problems. Their results showed that weight loss, low bone mineral density, and low regional density would reduce the risk of osteoporosis. However, the work of [17] divided men's and women's weightlifters into three levels: middleweight, heavyweight, and lightweight. After statistical optimization of weightlifters' physical fitness indicators further screened and analyzed and established weightlifters' physical fitness model.

Apart from the above, the work of [18] selected 45 weightlifters to test their physical function and made it clear about the highest anaerobic power of Chinese weightlifters. This work obtained that the athletes' back strength and absolute muscle strength of upper and lower limbs directly determine the sports performance. By diagnosing Rowers' physical fitness, the early work of [19] pointed out that the athletes' physical fitness diagnosis system involves screening effective physical fitness indicators, clarifying index weights, and diagnosis operation methods. In addition, they concluded that screening effective physical fitness indicators and clarifying weight indicators are an important basis for building a three-dimensional energy diagnosis system. Therefore, the author in [20] used radar analysis and the Pareto method to evaluate the special physical fitness of Chinese weightlifters. However, the work of [21] reasonably classified the physical structure of athletes into physiological function, shape, and psychological function whose physiological function refers to basic sports ability and special ability. The physical structure is divided into body shape and body shape, and the psychological function is divided into defensive psychological ability and offensive. In this regard, the authors of [22] build the evaluation system of weightlifters' snatch ability, clean and jerk ability, and physical fitness, and build the evaluation system of weightlifters' comprehensive ability combined with three index systems. Finally, the work of [23] uses the analytic hierarchy process to construct the hierarchical structure model of the teaching ability evaluation system, calculate the weight of each index, and clarify the graduate teaching ability evaluation system. The subsystems of the system mainly include the student evaluation system, teacher evaluation system, and intern self-evaluation system. Based on the evaluation model, the evaluation results are obtained by empirical method to obtain the status of graduate teaching ability. Inspired from the above, this paper focuses on three aspects: body shape, physical function, and physical fitness to analyze and builds the evaluation system of weightlifter's physical fitness based on the analytic hierarchy process. This work randomly selects 10 weightlifters to acquire three indicators data of body form, physical function, and physical fitness. In addition, each index score was computed according to the defined scoring standards, using the physical fitness assessment system described in this study for analysis.

3. Overview of Analytic Hierarchy Process

3.1. Concept of Analytic Hierarchy Process. In the 1970s, American mathematicians first proposed the analytic hierarchy process (AHP), which belongs to the system analysis method. By combining quantitative and qualitative methods, a complex problem is decomposed into multiple factors and different levels. Due to the above, we can obtain the weight of various processing problems, and provide a data reference for people's choices by comparing the different factors [24]. This approach may turn the qualitative analysis of the quantitative problem of conversion fee into a systematic analysis method that combines quantitative and qualitative analysis, simplify and mathematize a complicated problem, and is currently extensively used as an evaluation method. In the application of the AHP method, it is necessary to divide each index into the target layer, criterion layer, and index layer. In addition, calculate the evaluation index weight of each layer, then carry out a comprehensive analysis based on different evaluation factor indexes and personal subjective evaluation, and compare the two indexes. Calculate the value of their level of importance, make the Judgment Matrix Index weight coefficient, and calculate the weight coefficient.

3.2. Calculation Process of Analytic Hierarchy Process. Even though the AHP is among the most modern systems available in the field of management science and computational modeling, its sophistication makes it challenging to employ. Fortunately, software tools that simplify the mathematics-intensive aspect have been developed. The user must follow a basic data gathering process, which is then entered into the program to obtain the results. Figure 1 shows the flowchart of AHP calculation process.

3.2.1. Construction of the Hierarchical Structure Model. This paper uses the analytic hierarchy process to study the physical fitness evaluation system of weightlifters. After clarifying the evaluation purpose, it should analyze the evaluation objectives and different aspects. In the design, the evaluation indicators are analyzed from multiple dimensions, namely, primary indicators, secondary indicators, and tertiary indicators, and then a multi-level structure model is established based on multiple hierarchical indicators. The structural model is a pyramid model, which is divided into the target layer, criterion layer, and index layer from top to bottom [25].

3.2.2. Construction of the Pairwise Comparison Judgment Matrix. Based on the constructed hierarchical structure model, two indexes are compared at the same level to clarify the importance of each index at the same level, and then the "1–9 scale method" is used to construct the comparison judgment matrix with different levels, which is shown in Table 1. According to this table, the matrix must meet $G_{ij} > 0$; $G_{ij} = 1$; $G_{ij} = 1/G_{ji} < i$, $(j = 1, 2, 3, \ldots N)$ requirements. If the AM criterion is linked to many indications in the bottom layer, such as G_1, G_2, G_3, and G_n, the judgment matrix built using the 1–9 scale approach is shown in Table 2.

3.2.3. The Relative Weight of the Judgment Matrix Is Obtained. A judgment matrix is a square matrix that represents the size difference between the objects being evaluated. In order to obtain the Judgment matrix, we must first calculate the max value, i.e., $\lambda \max$ using $B\omega = \lambda \max x$ calculates the ω eigenvector. The process of calculation can be as follows:

(i) Product finding: find the product of each row element on the B judgment matrix $G_i = \prod_{j=1}^{n} a_{ij} \, (i = 1, 2, \ldots, n)$

(ii) N$^{\text{th}}$ root finding: find the n^{th} root of PI in each row $\varpi j = \sqrt[n]{Gi}$

(iii) Normalization of vectors: normalize all vectors, $\varpi = (\varpi_1, \varpi_2, \ldots, \varpi_n)$, the weight coefficient ϖi is calculated by

$$\varpi_i = \frac{\varpi_i}{\sum_{j=1}^{n} \varpi_j}. \tag{1}$$

3.2.4. Consistency Test. The consistency test is intended to evaluate one essential, but not sufficient, a component of robustness. That is, the capacity to arrive at the same answer independent of the starting point. Any resilient approach that always finds the global minimum will produce the same result every time. A nonrobust approach that can be captured by a local minimum, on the other hand, is likely to produce various answers based on the beginning location. The consistency index (Ci) can be calculated using

$$\lambda_{\max} = \frac{1}{n} \sum_{j=1}^{n} \frac{(B\omega)_j}{\omega_j},$$
$$\text{CI} = \frac{\lambda \max - n}{n - 1}. \tag{2}$$

The higher the CI value, the lower the consistency of the matrix.

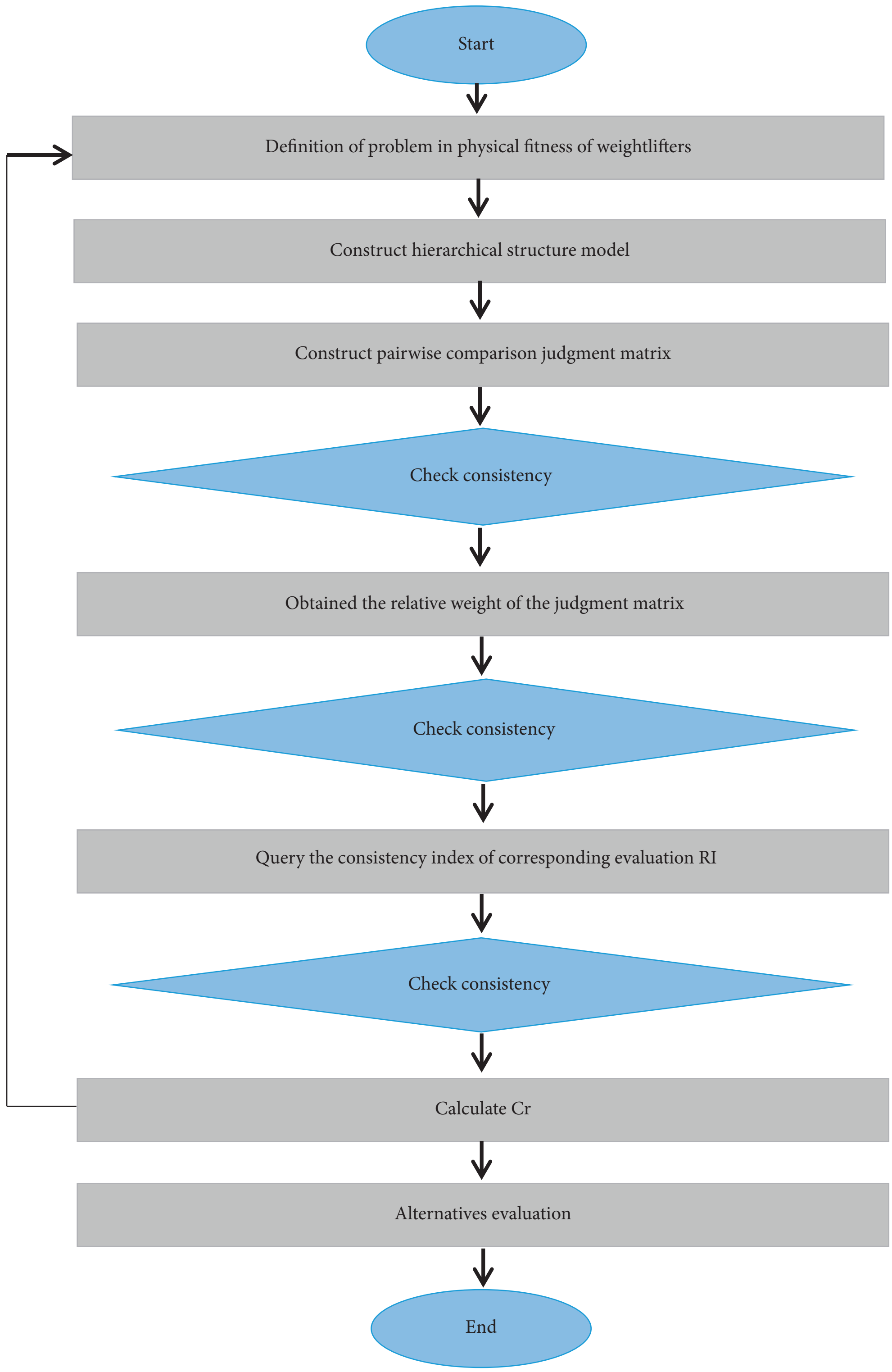

Figure 1: Flowchart of AHP calculation process.

Table 1: Judgment matrix model.

An	G_1	G_2	...	G_n
G_1	G_{11}	G_{12}	...	G_{1n}
G_2	G_{21}	G_{22}	...	G_{2n}
...	...	...	...	...
G_n	G_{n1}	G_{n2}	...	G_{nn}

(i) Calculation of CR: by comparing RI and CI, it is clear whether the matrix has a satisfactory consistency, where $CR = CI/RI$

Here, CR is the test coefficient.

If the value of CR is 0, it indicates that the consistency of the judgment matrix is ideal. However, if the value of CR is

Table 2: Judgment matrix model constructed by the 1–9 scaling method.

Scale value	Definition
1	Equally considerable
3	Slightly considerable
5	Obviously considerable
7	Strongly considerable
9	Absolutely considerable
Combined value of 2, 4, 6, and 8	Middle value of 02 neighboring scales
Complementary	Scale values are complementary to each other

less than 0.1, it indicates strong consistency. If the value of CR is greater than or equal to 0.1, it proves that the consistency of the judgment matrix is poor. It is necessary to modify the values of different items on the matrix until the value of CR is less than 0.

4. Evaluation System of Weightlifters' Physical Fitness Based on Analytic Hierarchy Process

4.1. Factors of Physical Fitness of Weightlifters. Many elements contribute to physical fitness, such as muscular strength, stamina, and balance. It is an exercise that maintains our bodies and brains fit and healthy. This paper focuses on the analysis of the physical fitness of weightlifters. When evaluating the physical fitness of weightlifters, first analyze its constituent factors, including body function, body shape, and physical quality [26]. Starting from the characteristics of weightlifting events, the factors constituting the subsystem are quite different from other events, such as sensitivity, endurance, and other three types of physical quality as a part of physical quality, rather than physical elements of weightlifters [27]. Based on the characteristics of weightlifting events, this paper constructs the physical fitness composition of weightlifters in Figure 2.

4.2. Construction of the Physical Fitness Evaluation System for Weightlifters. In this paper, before establishing the physical fitness evaluation system of weightlifters by analytic hierarchy process, we should first clarify the evaluation objectives and objects. The research object of this paper is the weightlifters with excellent performance in the weightlifting competition. Then, further, clarify the index system and index weight, complete the design of evaluation criteria, and establish the weightlifter evaluation system. In Figure 3, the process of constructing the weightlifter physical evaluation index system is shown.

In this paper, we should first determine the indicators when establishing the physical fitness evaluation system of weightlifters, so we can find a large number of indicators related to the evaluation of weightlifters by looking up relevant literature and field research. Then, starting from the physical fitness of weightlifters, clarify the primary indicators, mainly including body shape, physical function, and sports quality, as well as 12 secondary indicators. Based on this, establish the physical fitness evaluation system of weightlifters based on AHP, which is shown in Figure 4 [28].

4.3. Weight Determination of the Physical Fitness Evaluation Index of Weightlifters

4.3.1. Construction of the Pairwise Comparison Judgment Matrix. According to the comparison matrix on the index level list, multiple indices on the same level should be selected for comparison; therefore, this study employs the analytic hierarchy method to construct the physical fitness evaluation system for weightlifters. Table 3 shows the relative relevance level. According to the registration form of relative importance, if Bx and By are slightly different then the corresponding Bxy is 3, 5, 7, and 9, while Byx is 1/3, 1/5, 1/7, and 1/9. However, if Bx and By are equal, then the compromise values on Bxy in the reference real state are 2, 4, 6, and 8, while, the corresponding Byx values are determined as 1/2, 1/4, 1/6, and 1/8. Based on this principle, this paper calculates and analyzes the comparison results of various factors using a judgment matrix of pairwise comparison (Table 4).

Based on the selected evaluation indexes, referring to Table 4, this paper evaluates the importance score of each index in combination with weightlifter coaches, professors, and experts in this field, by calculating the average score of each index and establishing a judgment matrix based on the score of each index.

4.3.2. Calculation of the Index Weight. The square root technique is the most often used algorithm for computing the weight based on the analytic hierarchy process. This method needs to calculate the product according to each line, and then calculate the index weight to the n^{th} power. The following are the detailed calculation process steps:

(i) Step 1: find the product of each row element M on the B judgment matrix can be obtained using the following equation:

$$M_x = \prod_{y=1}^{n} B_{x,y}, \quad x = 1, 2, 3, \ldots, n. \tag{3}$$

(ii) Step 2: find the n^{th} power root $w$of the product Mm of each row as given in the following equation:

$$w_x = \sqrt[n]{M_x}, \quad x = 1, 2, 3, \ldots\ldots, n, \tag{4}$$

where n is the order of the judgment matrix.

(iii) Step 3: calculate w index weight with the help of the following equation:

$$W_x = \frac{w_x}{\sum w}, \quad x = 1, 2, 3, \ldots\ldots, n. \tag{5}$$

4.3.3. Consistency Test. If there is inconsistency in the judgment matrix, it is because there are differences in the grading skills and value orientation selected by experts to compare the indicators. The second is the

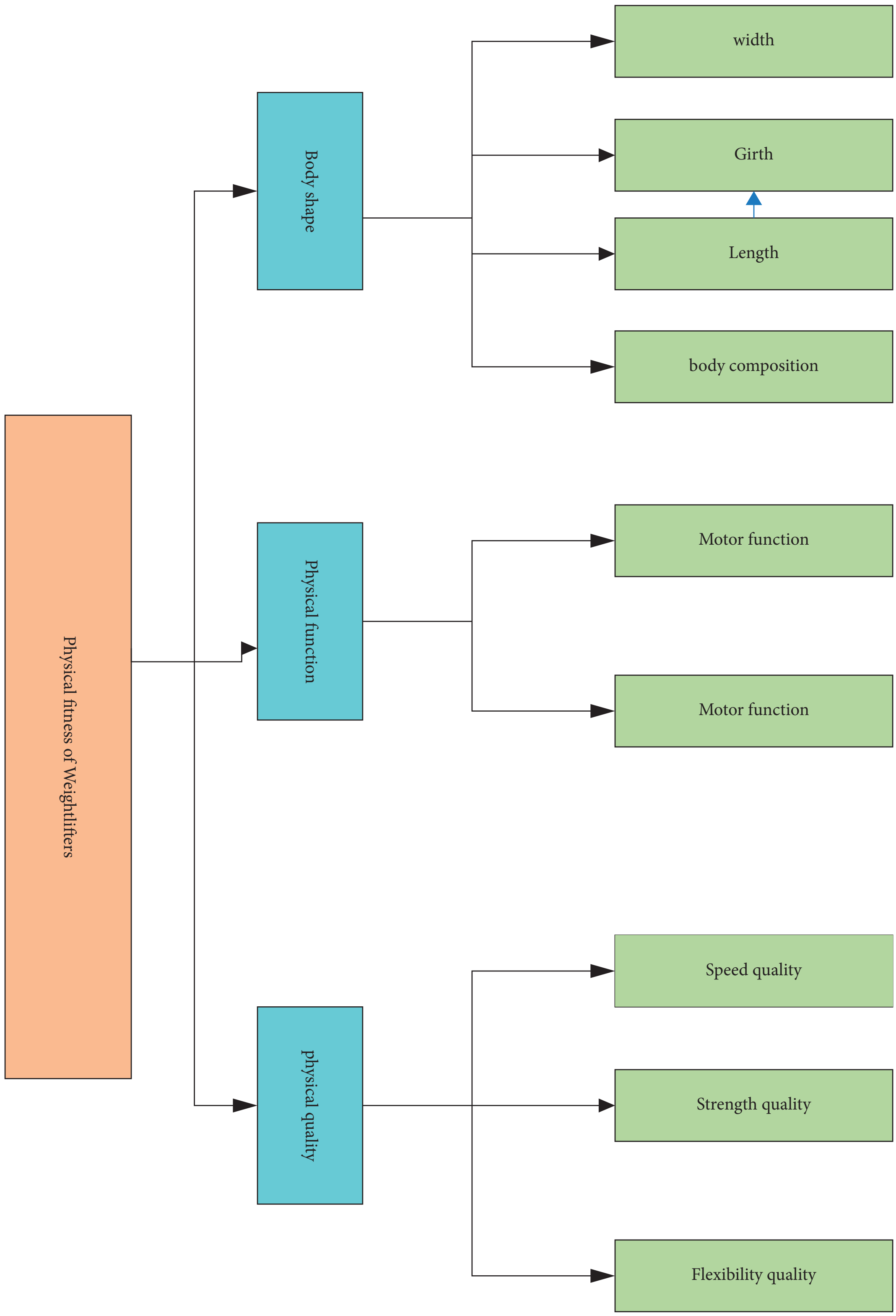

Figure 2: Physical constitution of weightlifters.

nonproportionality to assign the grade of key indicators. Therefore, when the order of the N judgment matrix exceeds 2, it is impossible to construct a consistent matrix. However, there is also a degree of deviation between the judgment matrix and the consistency condition. It is necessary to accurately identify the acceptance of the judgment matrix, which is the purpose of the consistency test. The following are the steps of the consistency inspection process:

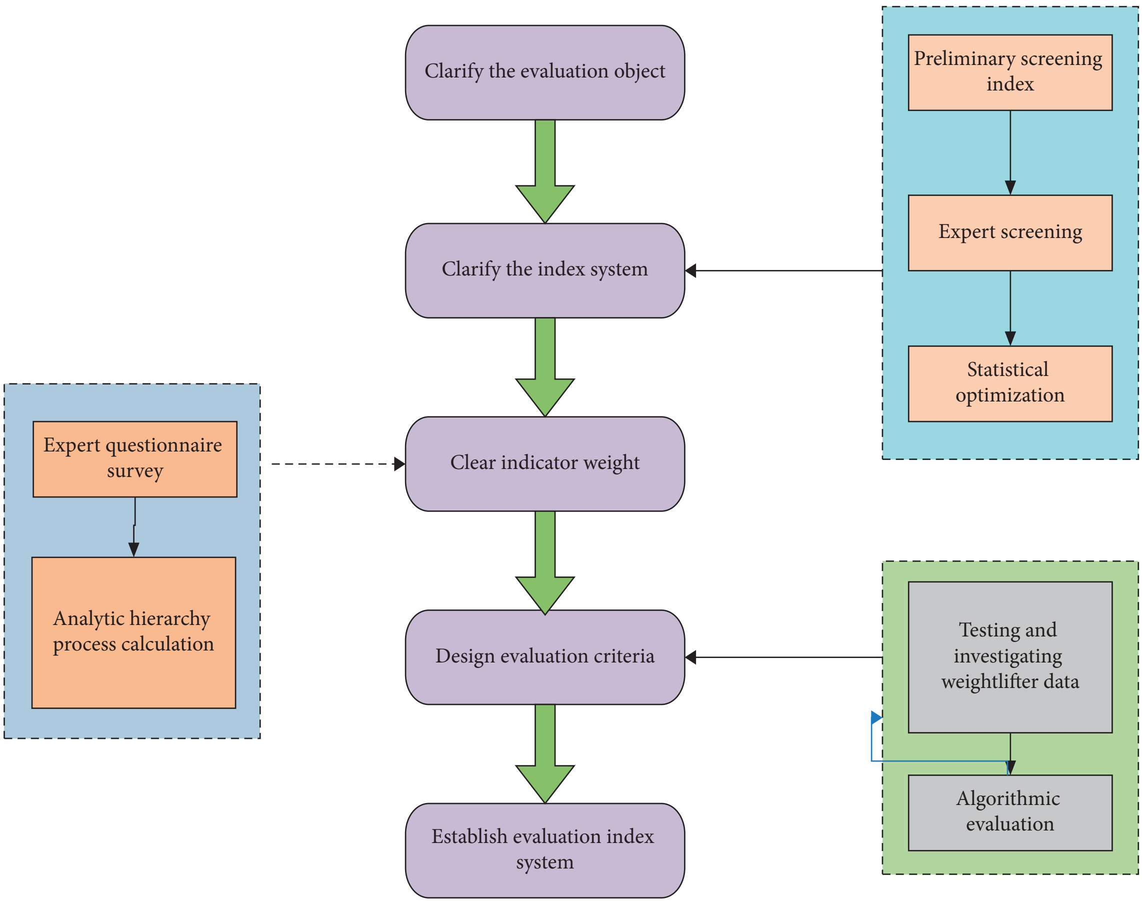

Figure 3: Construction process of the special physical fitness evaluation index system for weightlifters.

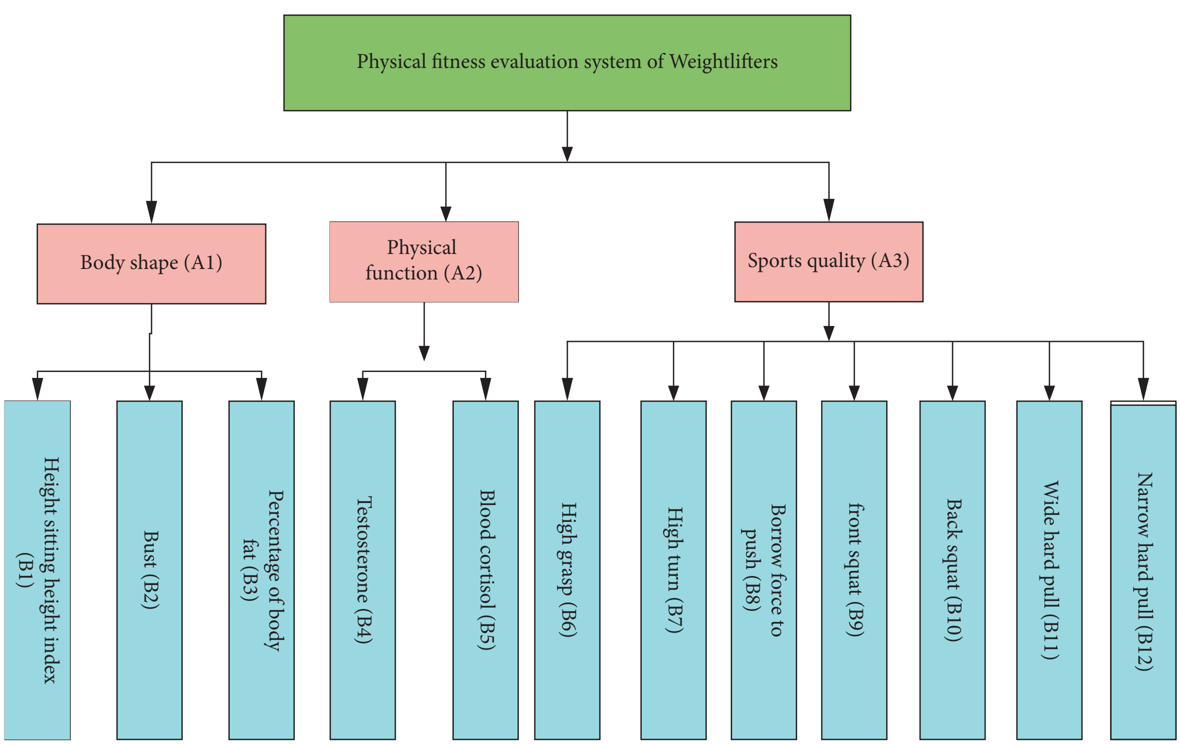

Figure 4: Physical fitness evaluation systems of weightlifters.

Table 3: Comparison of RI value of the partial random consistency index.

Number of elements (n)	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.59	0.92	1.13	1.25	1.33	1.42	1.46

Table 4: Relative importance level.

Relative significance	Description	Explanation
1	Equally considerable	Both supply regularly to the objective
3	Slightly more considerable	Based on knowledge, 01 is more beneficial than the other
5	Highly considerable	Based on knowledge, 01 is more beneficial than other evaluations
7	Really considerable	One is very beneficial and established compared to the other
9	Absolutely considerable	Very considerable
Combined value if 2, 4, 6, and 8	Middle value of importance between 02 neighboring phases	A cooperation can be utilized

(i) Step 1: in the inspection process of consistency, we first obtained the value on the judgment matrix represented by $\lambda_{\max}$ (maximum eigenvalue) as given in the following equation:

$$AW = \begin{pmatrix} 1 & B_{12} & \dots & B_{1n} \\ B_{21} & 1 & \dots & B_{2n} \\ \dots & \dots & \dots & \dots \\ B_{n1} & B_{n2} & \dots & 1 \end{pmatrix} \times \begin{pmatrix} W_1 \\ W_2 \\ \dots \\ W_n \end{pmatrix}. \tag{6}$$

(ii) Step 2: the consistency index represented by CI and can be calculated using the following equation:

$$\mathrm{CI} = \frac{(\lambda_{\max} - n)}{(n-1)}. \tag{7}$$

(iii) Step 3: calculate the CR consistency value as given in the following equation:

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{RI}}. \tag{8}$$

Here, RI is the randomness index. The consistency index of relevant judgment matrix randomly generated determines the index level according to the number of N comparison indexes. The comparison of RI value of partial random consistency index can be explained in Table 3.

According to Table 3, if λ The Max and N are equal, the CR value of 0 indicates the exact consistency; the higher the CR value indicates the insufficient complete consistency of the judgment matrix. Generally, to ensure the CR value is less than 0.1, the consistency of this judgment matrix can meet the requirements, otherwise, compare the indicators again.

4.4. Calculating Weights of Physical Fitness Indicators of Weightlifters Based on Analytic Hierarchy Process. Based on the analytic hierarchy process, this paper establishes a physical fitness evaluation system for weightlifters and calculates the weight after defining each physical fitness index. Compared with the total physical fitness goal T of weightlifters, the judgment matrix and weights between the physical fitness (A1), physical function (A2), and physical fitness (A3) of each first-level indicator are given. First, we use Equation (9) to calculate the maximum eigenvalue.

$$A \times W = \begin{pmatrix} 1 & \frac{1}{2} & \frac{1}{4} \\ 1 & 2 & \frac{1}{5} \\ 4 & 5 & 2 \end{pmatrix} \times \begin{pmatrix} 0.13 \\ 0.22 \\ 0.69 \end{pmatrix} = \begin{pmatrix} 0.36 \\ 0.62 \\ 2.11 \end{pmatrix}, \tag{9}$$

$$\lambda \max = \frac{1}{3} \times \left(\frac{0.36}{0.13} + \frac{0.63}{0.22} + \frac{2.11}{0.69} \right) = 8.69. \tag{10}$$

4.4.1. Finding the Consistency Index. A consistency ratio relies on the number of criteria, checks the consistency utilized to generate a matrix in AHP. Based on the above equations, the consistency index may be obtained as follows:

$$\mathrm{CI} = 0.0124. \tag{11}$$

4.4.2. Finding the Consistency Ratio. The size of the matrix has the greatest influence on CR. Furthermore, depending on the sample features and the assessment, CR for individual specialists is limited to 0.10 or 0.15; however, CR for collective replies may be lowered to 0.20 to account for non-expert answers. In our case, if the value of n is 3, RI can be calculated to be 0.59 as calculated in

$$\mathrm{CR\ value\ is} \frac{0.0124}{0.59} = 0.021. \tag{12}$$

The CR value of 0.021 is smaller than 0.1, indicating that this judgment matrix meets the requirements of consistency test, and the calculated index weight can be used in the evaluation analysis. After calculating the weights of all the indexes, the weight table of the physical fitness indexes of the weightlifters can be constructed and displayed in Table 5.

5. Analysis of Physical Performance Evaluation Results of Weightlifters

5.1. Body Morphology Evaluation and Analysis. This paper establishes an evaluation system of weightlifters' physical fitness based on the analytic hierarchy process. When using this evaluation system to evaluate the physical fitness of weightlifters, the body shape index should be analyzed first. Since weightlifters are divided into kilograms by weight, each kilogram weightlifter participates in the same weight competition [29]. Before evaluating and analyzing the body shape of weightlifters, consult the relevant literature data, obtain a large amount of data from coaches on the weightlifters' body shape measurement standards, and discuss with experts to clarify the reference basis. In this paper, the body shape data of 10 elite weightlifters of 56 kg class are selected, and the standard deviation and average value of the physical fitness indexes of 32 weightlifters are calculated. Table 6 explains the findings of chest circumference and body fat percentage data from 56 kg weightlifters.

According to the data in Table 6, the significant results obtained by the K-S test show that the chest circumference and body fat percentage are 0.985 and 0.841, respectively, which are above 0.05. Therefore, this data meets the requirements of normal distribution and can be used to build an evaluation index based on the above. Here, we have measured the body shape data of 32 56 kg weightlifters. After simple calculation, the mean values of chest circumference and body fat percentage were 86.75 and 11.18, which were lower than those obtained by the test and met the requirements. Then, the body shape score of the first level index in the physical fitness system of weightlifters is calculated by the analytic hierarchy process. The body shape evaluation score is calculated by the percentage of body fat of weightlifters, which is shown in Figure 5.

Figure 5 shows the percentage of body fat of 10 weightlifters. The score is set according to the percentage of body fat. Body fat over 14.49% is 0, body fat over 14% is less than 14.49% is 5, body fat between 13.5% and 14% is 10, body fat between 13% and 13.49% is 15, body fat between 12.5 and 12.99 is 15, and so on. The highest 100 body fat is less than 6.61. According to the data in the figure, the body fat score of 32 weightlifters is mostly in the range of 70–95, indicating that they are in good shape. Only three weightlifters have 50, 55, and 40 points of body fat. In the later stage, they need to do more exercises to reduce the body fat. One body fat score is 100 points.

5.2. Evaluation and Analysis of Physical Function. There are only two indexes in the body function evaluation system of weightlifters. The two indexes show little difference in different levels, so this paper chooses a common index when

Table 5: Weight of the evaluation index for physical fitness of weightlifters.

Primary index	Weight	Secondary index	Weight
A1 body shape	0.14	Height sitting height index (B1)	0.11
		Bust (B2)	0.05
		Percentage of body fat (B3)	0.45
A2 physical function	0.19	Testosterone (B4)	0.74
		Blood cortisol (B5)	0.26
A3 sports quality	0.67	High grasp (B6)	0.14
		High turn (B7)	0.08
		Borrow force to push (B8)	0.04
		Front squat (B9)	0.34
		Back squat (B10)	0.14
		Wide hard pull (B11)	0.06
		Narrow hard pull (B12)	0.23

Table 6: Chest circumference and body fat percentage data of 56 kg weightlifters.

Parameter	Bust (cm)	Constitution percentage
Mean value	86.75	11.18
Standard deviation	2.77	1.68
Minimum	81.2	6.9
Maximum value	93	15.8

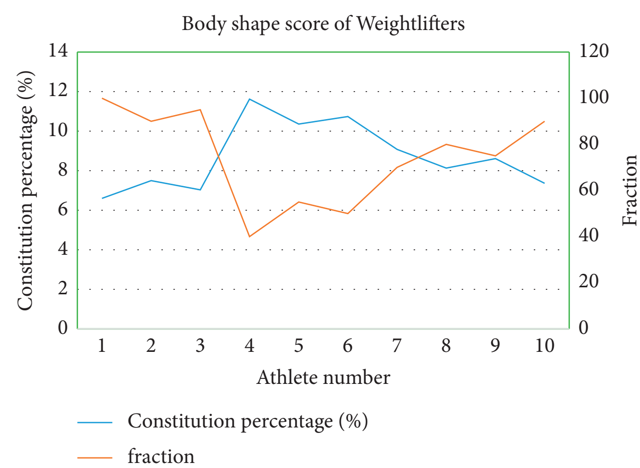

Figure 5: Body shape score of weightlifters.

formulating the evaluation standard of body function. When testing the body function data of weightlifters, it will be affected by the accuracy of the testing equipment, the experience of the testers, and the professional ability, which will cause some errors in the test results. Therefore, this paper adjusts and determines according to the national weight-lifting team standards combined with expert recommendations. The body function data of weight-lifters are shown in the following Table 7.

According to the data of the National Weightlifting Team and the national requirements, the evaluation standards of the physical function of the weightlifters are set up,

Table 7: Body function data table for weightlifters.

Parameters	Testosterone (ud/dl)	Blood cortisol (ud/dl)
Mean value	612.3	14.17
Standard deviation	154.2	3.05
Minimum	151.4	0.12
Maximum value	1352.1	26.27

Table 8: Evaluation criteria for body function of weightlifters.

Fraction	Testosterone (ud/dl)	Blood cortisol (ud/dl)
100	957.6	24.04
95	920.1	22.95
90	881.87	22.31
85	843.02	21.29
80	803.97	20.51
75	766.03	19.58
70	726.92	18.69
65	689.76	17.79
60	651.02	16.91
845.655	612.04	15.98
50	574.55	15.09
45	536.09	14.17
40	495.79	13.29
35	457.89	12.53
30	420.04	11.56
25	382.11	10.76
20	343.06	9.68
15	305.01	8.85
10	265.9	7.95
5	228.13	7.03
0	Less than 228.13	Less than 7.03

and the evaluation standards of the physical function are listed in Table 8.

In this study, 10 weightlifters were chosen at random to have their blood testosterone levels measured in physical function, and the findings were displayed as a polyline graph, as shown in Figure 6.

The data in Figure 6 show that the highest testosterone level is 926.7 ud/dl, the lowest is 690.3 ud/dl, the lowest is 65, and the others are basically between 70 and 90. This data shows that the weightlifters' bodies are basically relatively good, there is no poor phenomenon, and they can participate in weightlifting training and competition [30].

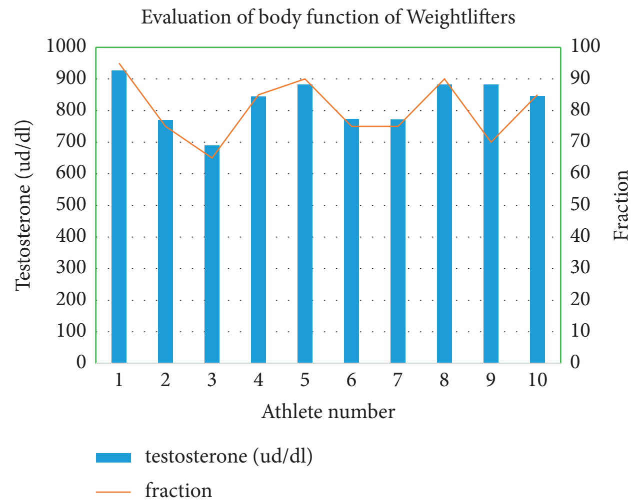

Figure 6: Body function evaluations of weightlifters.

5.3. Evaluation and Analysis of Sports Quality. This paper searches for relevant data and data given by experts in this field when evaluating and analyzing the quality of weightlifters. This study creates scoring criteria for the sport quality of weightlifters in the 6 kg class by using two indexes of high grab and broad pull in the evaluation of weightlifters' sport quality and presents the particular data in Table 9.

The data in Table 9 are used as the main criteria to evaluate the athletic quality of weightlifters. Based on these criteria, the data of 10 randomly selected weightlifters are judged. The high grab scores of a weightlifter may be determined from the data in the table by measuring the number of high grab kilos of a weightlifter during their regular training and summarizing statistical data. Figure 7 shows the comparison of sports quality scoring of weightlifters [31].

Table 9: Sports quality score for 56 kg weightlifters (kg).

Fraction	High grasp (kg)	Wide hard pull (kg)
100	125	182
95	121	178
90	118	174
85	115	169
80	111	166
75	108	159
70	105	156
65	101	153
60	97	147
55	95	143
50	91	140
45	88	137
40	83	132
35	80	126
30	77	124
25	75	119
20	71	115
15	67	112
10	64	105
5	62	101
0	Less than 62	Less than 101

The number of high grab kilograms of 10 weightlifters is listed in Figure 7, and the corresponding score is calculated according to the number of high grab kilograms. Only one of them had a low score of 60, a high snap of 98 kg, a high snap of 75 kg, a high snap of 109 kg, and the other eight had more than 80 points per person. The data show that the 10 weightlifters generally perform better.

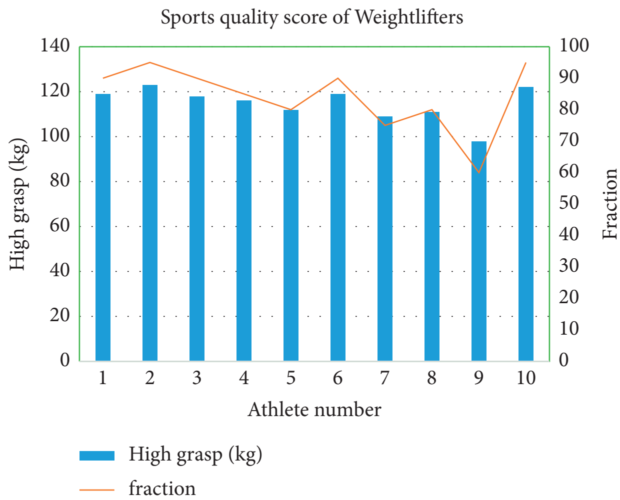

Figure 7: Sports quality scoring of weightlifters.

6. Conclusions

In recent years, weightlifting has been favored by Chinese athletes and has achieved higher results in world-class competitions after training. However, weightlifters have higher requirements for strength and technology in training, and at the same time, they have higher requirements for the physical fitness of weightlifters. Weightlifters' physical fitness involves a lot of content. This article only focuses on three aspects: body shape, physical function, and physical fitness to analyze and builds the evaluation system of weightlifter's physical fitness based on the analytic hierarchy process. This work randomly selects 10 weightlifters to acquire three indicators data of body form, physical function, and physical fitness. In addition, each index score was computed according to the defined scoring standards, using the physical fitness assessment system described in this study for analysis. The results show that three of the weightlifters have lower body fat scores of 50, 55, and 40 points, and the highest testosterone score is 95 points, with a value of 926.7 ud/dl. The highest snatch score in sports quality is 95 points and the weight is 123 kg.

Data Availability

All the data are included within this paper.

Conflicts of Interest

The authors declare no conflicts of interest.

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