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The consistency test research of sprint athletic ability based on AHP method

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ABSTRACT

Sprinters' athletic ability is a capability demonstrated by the joint action of body shape, physiology function, sport intelligence, athletic skills, psychological quality and athletic quality. Now the scientific selection of athletes has higher and higher proportion in sports training techniques and status, the means are more and more advanced, and the comprehensive evaluation method of human athletic ability are increasingly close to the actual potential of the athletes. In this paper, it analyzes the sprinter's athletic ability, extracts the four major indexes and its corresponding ten micro indexes to comprehensively evaluate the athletes' sprint athletic ability, uses AHP (Analytic Hierarchy Process) to establish a hierarchical structure, uses the pair-wise comparison method to construct the judgment matrix for the structure, and conducts the consistency test model on this basis.

Key words: Athletic ability, judgment matrix, AHP algorithm, Matlab software

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INTRODUCTION

Sprint is a limit strength movement that mainly bases on energy-supply of anaerobic metabolism. So the speed capability, reaction time, the maximum operating frequency and anaerobic endurance and other factors that determine the competitive level of sprint are largely determined by genetics. And the changes of acquired cultivation are just to get this talent ability into full play. Therefore, the evaluation index for the sprinters athletic ability is also largely determined by the athlete's innate factors, but evaluation index for the athlete's athletic ability is mostly qualitative indicators. Analytic Hierarchy Process is AHP for short; the method was put forward by American professor Saaty T.L. in the early 1970s. AHP is a simple, flexible and practical multi-criteria decision making method, and has a unique effect for the quantitative analysis of qualitative problem. The method can divide a variety of factors in complex problems and makes them principled, through pair-wise comparison between elements of various levels, gets the quantitative description of the evaluation system, and then obtains the decision scheme using the data principle in the quantitative system and calculation method. Due to the characteristics of AHP, since 1982 after the introduction it is rapidly and widespread applied in various fields of social economy. With the development of computer technology, the functions of mathematics software Matlab have become gradually stronger, and can be used to compute the AHP model more accurately, faster and more professionally.

For the evaluation of athletic ability, the application of AHP method and AHP realization of Matlab, many people have made efforts, achieved certain achievements, and provided the impetus for the development of sports cause and the corresponding cause. Based on the previous study results, this paper uses AHP to evaluate the sprint athletic capacity, and by the actual indicator parameters of two athletes, and uses Matlab software to realize the operation process and obtains its evaluation results.

EXPERIMENTAL SECTION

2. AHP model building

AHP is cut complex decision-making context into many small parts, and these parts will be organized into a hierarchical tree structure, and the relative importance of the adjacent part is given to the right weight values, then analyze and obtain the priority of each part.

2.1 AHP analysis step

AHP analysis includes four steps, as shown in Figure 1:

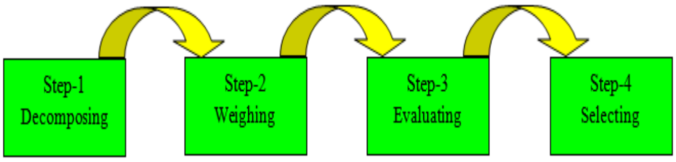

Figure 1: The four steps' schematic of AHP analysis

In Figure 1 step-1 indicates that the overall system is decomposed into a series of small parts. The sprint athletic capacity in this paper can be divided into physical shape, physiology, psychological quality and sports quality four major indicators; wherein body shape indicators include height, length ratio of thigh and calf and Quetlet index three small portions; physiological indicators include cardiac function index and vital capacity/weight values two small portions; the psychological quality indicators is mainly embodied by the sound reaction time; the sport quality indexes include 50m limit running, standing long jump, triple jump performance and back-throw shot distance four small parts, that is, the overall exercise capacity system is divided into four major terms and ten minor terms; Step-2 indicates that all the small parts after the system decomposition are assigned weights; Step-3 represents the assessment of all the small parts on the overall contribution ability to the athletic ability of athletes; Step-4 means that for the contribution ability of all the small parts on the athletic ability of different athletes obtain the evaluation results .

2.2 The hierarchical structure building of athletic ability

When research questions using the AHP method, according to the causal relationship of the various factors in the question it can be divided into several levels, called hierarchical. In this paper, the problem is relatively complex and is divided into four layers; the top layer is referred to as the goal layer and O layer for short that is athletic ability; the middle layer is the criterion layer and called C layer for short, it is divided into two layers respectively four major indicators C1 layer and its corresponding fraction content C2 layer; the bottom layer is the measures layer and called the P layer for short, that is two athletes. Figure 2 shows the hierarchical structure.

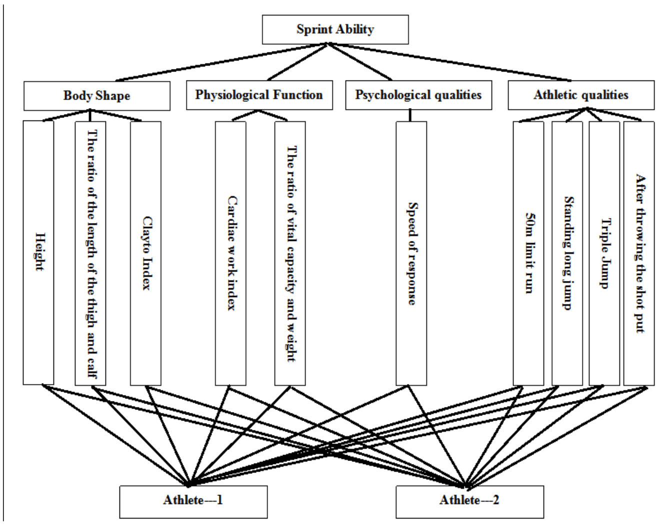

Figure 2: The hierarchical structure diagram of athletic ability

2.3 Assessment model building and algorithm design

Definition 1: The weight representation between the first layer and the second layer is shown in the formula (1):

$$w_1 + w_2 + w_3 + w_4 = 1 \tag{1}$$

In Formula (1) w_1 means the contribution weights of the body shape on athletic ability, w_2 means the contribution weights of the body functions on athletic ability, w_3 means the contribution weights of the psychological quality on athletic ability, and w_4 means the contribution weights of the athletic ability on athletic ability.

Definition 2: The weight representation between the second layer and the third layer is shown in the formula (2):

$$\begin{cases} w_{11} + w_{12} + w_{13} = 1 \\ w_{21} + w_{22} = 1 \\ w_{31} = 1 \\ w_{41} + w_{42} + w_{43} + w_{44} = 1 \end{cases} \quad (2)$$

In Formula (2), w_{11}, w_{12}, w_{13} respectively represents the contribution weights of height, leg length ratio and the Quetlet index on the body shape; w_{21}, w_{22} respectively represents the contribution weights of cardiac function index and vital capacity/weight values on the physical function; w_{31} represents the contribution weights of sound reaction time on the psychological quality, which is clearly one; $w_{41}, w_{42}, w_{43}, w_{44}$ respectively represents the contribution weights of 50m limit Race, standing long jump, triple jump performance and back-throw shot distance on the sport quality.

Definition 3: The weight representation between the third layer and the forth layer is shown in the formula (3):

$$w_{ij1} + w_{ij2} = 1 \quad (3)$$

In Formula (3) the meaning of w_{ijk} is shown in Table 1:

Table 1: Variable weights description

Variable	Description
w_{111} , w_{112}	Respectively represent height's advantage extent of athlete 1 and athlete 2
w_{121} , w_{122}	Respectively represent leg length ratio's advantage extent of athlete 1 and athlete 2
w_{131} , w_{132}	Respectively represent Quetlet index's advantage extent of athlete 1 and athlete 2
w_{211} , w_{212}	Respectively represent cardiac function index's advantage extent of athlete 1 and athlete 2
w_{221} , w_{222}	Respectively represent vital capacity/ weight's advantage extent of athlete 1 and athlete 2
w_{311} , w_{312}	Respectively represent sound reaction time's advantage extent of athlete 1 and athlete 2
w_{411} , w_{412}	Respectively represent 50 m limit race results' advantage extent of athlete 1 and athlete 2
w_{421} , w_{422}	Respectively represent standing long jump performance's advantage extent of athlete 1 and athlete 2
w_{431} , w_{432}	Respectively represent triple jump performance's advantage extent of athlete 1 and athlete 2
w_{441} , w_{442}	Respectively represent back-throw shot distance's advantage extent of athlete 1 and athlete 2

Evaluation algorithm design:

Step-1: Calculation of the athletic ability index for athlete 1 is in the formula (4) below:

$$w_1 \times \sum_{j=1}^{3} w_{1j1} \times w_{1j} + w_2 \times \sum_{j=1}^{2} w_{2j1} \times w_{2j} + w_3 \times w_{311} + w_4 \times \sum_{j=1}^{4} w_{4j1} \times w_{4j} = A_1 \quad (4)$$

In Formula (4) A_1 means the athletic ability index of athlete 1.

Step-2: Calculation of the athletic ability index for athlete 2 is in the formula (5) below:

$$w_1 \times \sum_{j=1}^{3} w_{1j2} \times w_{1j} + w_2 \times \sum_{j=1}^{2} w_{2j2} \times w_{2j} + w_3 \times w_{312} + w_4 \times \sum_{j=1}^{4} w_{4j2} \times w_{4j} = A_2 \quad (5)$$

In Formula (5) A_2 means the athletic ability index of athlete 2.

<u>Step-3:</u> Output the judgment result

When $A_1 > A_2$, output "athlete 1's athletic ability is higher than athlete 2", when $A_1 < A_2$, output "athlete 2's athletic ability is higher than athlete 1."

2.4 The establishment of judgment matrix and weight generation algorithm design of each level

If you compare the impact size of n factors on certain factor F, we usually take the pair-wise factor comparison method to establish judgment matrix. Suppose a_{ij} indicates the influence ratio size of factor β_i and factor β_j on factor F, we can obtain the judgment matrix R; In this paper we suppose the judgment matrix between the first level and the second level is R_1, the element is a_{ij}, the factor is α_i, α_j, the element is F_1, then we have the judgment matrix R_1 as shown in the formula (6):

$$R_1 = \begin{bmatrix} F_1 & \alpha_1 & \alpha_2 & \alpha_3 & \alpha_4 \\ \alpha_1 & a_{11} & a_{12} & a_{13} & a_{14} \\ \alpha_2 & a_{21} & a_{22} & a_{23} & a_{24} \\ \alpha_3 & a_{31} & a_{32} & a_{33} & a_{34} \\ \alpha_4 & a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \quad (6)$$

In Formula (6), F_1 means factor athletic ability, $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ means the body shape factor, physical function factor, psychological factor and sport quality factor, a_{ij} means the influence size of factor α_i and factor α_j on factor F_1. For the determination of a_{ij} we usually use the 1～9 scale to assign the impact degree, as shown in Figure 3:

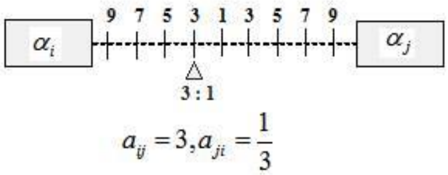

Figure 3: The assignment schematic of nine scale impact degree

Nine scale values are given in Table 2 below.

Table 2: Nine-scale schematic

Scale	Meaning
1	The two elements have the same importance
3	The former element is slightly important than the latter element
5	The former element is obviously important than the latter element
7	The former element is strongly important than the latter element
9	The former element is extremely important than the latter element

The judgment matrix R_2, R_3, R_4, R_5 of the four groups of two-factor $\beta_i \sim \beta_j, \gamma_i \sim \gamma_j, \chi_i \sim \chi_j, \xi_i \sim \xi_j$ for factor F_2, F_3, F_4, F_5 can be obtained, wherein the element is represented by $b_{ij}, c_{ij}, d_{ij}, f_{ij}$, as shown in the formula (7) (8) (9) and (10):

$$R_2 = \begin{bmatrix} F_2 & \beta_1 & \beta_2 & \beta_3 \\ \beta_1 & b_{11} & b_{12} & b_{13} \\ \beta_2 & b_{21} & b_{22} & b_{23} \\ \beta_3 & b_{31} & b_{32} & b_{33} \end{bmatrix} \quad (7)$$

$$R_3 = \begin{bmatrix} F_3 & \gamma_1 & \gamma_2 \\ \gamma_1 & c_{11} & c_{12} \\ \gamma_2 & c_{21} & c_{22} \end{bmatrix} \quad (8)$$

$$R_4 = \begin{bmatrix} F_4 & \chi_1 \\ \chi_1 & d_{11} \end{bmatrix} \quad (9)$$

$$R_5 = \begin{bmatrix} F_5 & \xi_1 & \xi_2 & \xi_3 & \xi_4 \\ \xi_1 & f_{11} & f_{12} & f_{13} & f_{14} \\ \xi_2 & f_{21} & f_{22} & f_{23} & f_{24} \\ \xi_3 & f_{31} & f_{32} & f_{33} & f_{34} \\ \xi_4 & f_{41} & f_{42} & f_{43} & f_{44} \end{bmatrix} \quad (10)$$

Taking R_1 for example, design the weight generation algorithm of each factor in the first level and the second level.
Step-1: Calculate the additive sum for each column, as shown in the formula (11) below:

$$a_1 = \sum_{i=1}^{4} a_{i1}, a_2 = \sum_{i=1}^{4} a_{i2}, a_3 = \sum_{i=1}^{4} a_{i3}, a_4 = \sum_{i=1}^{4} a_{i4} \quad (11)$$

Step-2: All elements in each column are divided by the sum of the column and generate the matrix B_1 as shown in formula (12) below:

$$B_1 = \begin{bmatrix} \frac{a_{11}}{a_1} & \frac{a_{12}}{a_2} & \frac{a_{13}}{a_3} & \frac{a_{14}}{a_4} \\ \frac{a_{21}}{a_1} & \frac{a_{22}}{a_2} & \frac{a_{23}}{a_3} & \frac{a_{24}}{a_4} \\ \frac{a_{31}}{a_1} & \frac{a_{32}}{a_2} & \frac{a_{33}}{a_3} & \frac{a_{34}}{a_4} \\ \frac{a_{41}}{a_1} & \frac{a_{42}}{a_2} & \frac{a_{43}}{a_3} & \frac{a_{44}}{a_4} \end{bmatrix} \quad (12)$$

Step-3: Calculating the average value of each row of the matrix B_1, the average value is the weight between the second layer and the first layer as shown in formula (13):

$$\begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \end{bmatrix} = \frac{1}{4} \begin{bmatrix} \sum_{i=1}^{4} \frac{a_{1i}}{a_i} \\ \sum_{i=1}^{4} \frac{a_{2i}}{a_i} \\ \sum_{i=1}^{4} \frac{a_{3i}}{a_i} \\ \sum_{i=1}^{4} \frac{a_{4i}}{a_i} \end{bmatrix} \quad (13)$$

According to the above algorithm the weight w_{ij} can be derived, as shown in formula (14):

$$\begin{bmatrix} w_{11} \\ w_{12} \\ w_{13} \end{bmatrix} = \frac{1}{3}\begin{bmatrix} \sum_{i=1}^{3} \frac{b_{1i}}{b_i} \\ \sum_{i=1}^{3} \frac{b_{2i}}{b_i} \\ \sum_{i=1}^{3} \frac{b_{3i}}{b_i} \end{bmatrix}, \begin{bmatrix} w_{21} \\ w_{22} \end{bmatrix} = \frac{1}{2}\begin{bmatrix} \sum_{i=1}^{2} \frac{c_{1i}}{c_i} \\ \sum_{i=1}^{2} \frac{c_{2i}}{c_i} \end{bmatrix}, [w_{31}] = [1], \begin{bmatrix} w_{41} \\ w_{42} \\ w_{43} \\ w_{44} \end{bmatrix} = \frac{1}{4}\begin{bmatrix} \sum_{i=1}^{4} \frac{f_{1i}}{f_i} \\ \sum_{i=1}^{4} \frac{f_{2i}}{f_i} \\ \sum_{i=1}^{4} \frac{f_{3i}}{f_i} \\ \sum_{i=1}^{4} \frac{f_{4i}}{f_i} \end{bmatrix} \quad (14)$$

2.5 Consistency checking algorithm design

As the complexity of the objective things are determined by the diversity of human, so in the constructing process of the judgment matrix $a_{ij} \bullet a_{jk} = a_{ik}$ does not have a strict set up; so in the calculation of the weight vector under a single criterion, we must conduct consistency test. Carry through algorithm design taking matrix R_1 for example, as follows:

Step-1: Obtain vector $\vec{a} = (a_1, a_2, a_3, a_4)$ and vector $\vec{w} = (w_1, w_2, w_3, w_4)$;

Step-2: Obtain the largest eigenvalue $\lambda_{\max}$ of matrix R_1, which is calculated as formula (15) below:

$$\lambda_{\max} = \vec{a} \bullet \vec{w} = (a_1 \quad a_2 \quad a_3 \quad a_4)\begin{pmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \end{pmatrix} \quad (15)$$

Step-3: Calculate the consistency index CI as calculated in formula (16) below:

$$CI = \frac{\lambda_{\max} - n}{n-1} = \frac{\lambda_{\max}}{3} - \frac{4}{3} \quad (16)$$

In Formula (16) n represents the number of criteria, that is the number of factors, so for the matrix R_1 $n = 4$.

Step-4: Compute consistency ratio CR as calculated in formula (17):

$$CR = \frac{CI}{RI} \quad (17)$$

In Formula (17) RI represents the Random Consistency Index value, as shown in Table 3.

Table 3: Consistency data

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Therefore, formula (17) can be rewritten as

$$CR = \frac{\lambda_{\max} - 4}{3 \times 0.9}.$$

Step-5: Consistency judgments

When $CR > 0.1$, the judgment result outputs that "showing a significant inconsistency"; when $CR < 0.1$, the judgment result outputs that "showing a fair consistency."

RESULTS

3.1 The determination table of the relative weight for sprinter

Table 4: The compared weights of two sprinters and the corresponding index

Contrast value of indicators	Variable	Athlete 1	Athlete 2
Height	w_{111} , w_{112}	0.5437	0.4563
The ratio of the length of the thigh and calf	w_{121} , w_{122}	0.9608	0.0392
Quetlet Index	w_{131} , w_{132}	0.1744	0.8256
Cardiac work index	w_{211} , w_{212}	0.1571	0.8429
The ratio of vital capacity and weight	w_{221} , w_{222}	0.2681	0.7319
Speed of response	w_{311} , w_{312}	0.1775	0.8225
50m limit run	w_{411} , w_{412}	0.5768	0.4232
Standing long jump	w_{421} , w_{422}	0.4982	0.5018
Triple Jump	w_{431} , w_{432}	0.2852	0.7148
After throwing the shot put	w_{441} , w_{442}	0.1559	0.8441

3.2 Actual data filling of the judgment matrix

By pair-wise comparison between indicators judgment matrix $R_i (i = 1,2,3,4,5)$ can be obtained as in formula (18) (19) (20) (21) and (22).

$$R_1 = \begin{bmatrix} F_1 & \alpha_1 & \alpha_2 & \alpha_3 & \alpha_4 \\ \alpha_1 & 1 & \frac{1}{3} & \frac{1}{3} & \frac{1}{5} \\ \alpha_2 & 3 & 1 & 1 & \frac{1}{3} \\ \alpha_3 & 3 & 1 & 1 & \frac{1}{3} \\ \alpha_4 & 5 & 3 & 3 & 1 \end{bmatrix} \quad (18)$$

$$R_2 = \begin{bmatrix} F_2 & \beta_1 & \beta_2 & \beta_3 \\ \beta_1 & 1 & \frac{1}{5} & \frac{1}{7} \\ \beta_2 & 5 & 1 & \frac{1}{3} \\ \beta_3 & 7 & 3 & 1 \end{bmatrix} \quad (19)$$

$$R_3 = \begin{bmatrix} F_3 & \gamma_1 & \gamma_2 \\ \gamma_1 & 1 & \frac{1}{3} \\ \gamma_2 & 3 & 1 \end{bmatrix} \quad (20)$$

$$R_4 = \begin{bmatrix} F_4 & \chi_1 \\ \chi_1 & 1 \end{bmatrix} \quad (21)$$

$$R_5 = \begin{bmatrix} F_5 & \xi_1 & \xi_2 & \xi_3 & \xi_4 \\ \xi_1 & 1 & 7 & 5 & 9 \\ \xi_2 & \frac{1}{7} & 1 & \frac{1}{3} & 3 \\ \xi_3 & \frac{1}{5} & 3 & 1 & 5 \\ \xi_4 & \frac{1}{9} & \frac{1}{3} & \frac{1}{5} & 1 \end{bmatrix} \quad (22)$$

3.3 Weight solving by Matlab

According to the former algorithm use Matlab software programming, the program code is shown in Figure 4:

```
A=input('A=');
[n,n]=size(A);
x=ones(n,100);
y=ones(n,100);
m=zeros(1,100);
m(1)=max(x(:,1));
y(:,1)=x(:,1);
x(:,2)=A*y(:,1);
m(2)=max(x(:,2));
y(:,2)=x(:,2)/m(2);
p=0.0001;i=2;k=abs(m(2)-m(1));
while  k>p
  i=i+1;
  x(:,i)=A*y(:,i-1);
  m(i)=max(x(:,i));
  y(:,i)=x(:,i)/m(i);
  k=abs(m(i)-m(i-1));
end
a=sum(y(:,i));
w=y(:,i)/a;
t=m(i);
disp(w);
```

Figure 4: Weights solving and program code

The computational results are shown in Figure 5:

```
A=[1 1/3 1/3 1/5;3 1 1 1/3;3 1 1 1/3;5 3 3 1]
    0.0781
    0.1998
    0.1998
    0.5222
A=[1 1/5 1/7;5 1 1/3; 7 3 1]
    0.0719
    0.2790
    0.6491
A=[1 1/3;3 1]
    0.2500
    0.7500
A=[1]
     1
A=[1 7 5 9;1/7 1 1/3 3;1/5 3 1 5;1/9 1/3 1/5 1]
    0.6574
    0.0942
    0.2027
    0.0457
```

Figure 5: the results of weight solving by Matlab

Substituting the result into formula (13) and (14) then the formula (23) and (24) can be obtained.

$$\begin{pmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \end{pmatrix} = \begin{pmatrix} 0.0781 \\ 0.1998 \\ 1.1998 \\ 0.5222 \end{pmatrix} \quad (23)$$

$$\begin{pmatrix} w_{11} \\ w_{12} \\ w_{13} \end{pmatrix} = \begin{pmatrix} 0.0719 \\ 0.2790 \\ 0.6491 \end{pmatrix}, \begin{pmatrix} w_{21} \\ w_{22} \end{pmatrix} = \begin{pmatrix} 0.2500 \\ 0.7500 \end{pmatrix}, (w_{31}) = (1), \begin{pmatrix} w_{41} \\ w_{42} \\ w_{43} \\ w_{44} \end{pmatrix} = \begin{pmatrix} 0.6574 \\ 0.0942 \\ 0.2027 \\ 0.0457 \end{pmatrix} \quad (24)$$

3.5 Consistency test achieved Matlab

Matrix that needs consistency check is R_1, R_2, R_5, according to the algorithm in 2.5 conducts Matlab programming, and the program code is shown in Figure 6:

```
A=input('A=');
[n,n]=size(A);
x=ones(n,100);
y=ones(n,100);
m=zeros(1,100);
m(1)=max(x(:,1));
y(:,1)=x(:,1);
x(:,2)=A*y(:,1);
m(2)=max(x(:,2));
y(:,2)=x(:,2)/m(2);
p=0.0001;i=2;k=abs(m(2)-m(1));
while  k>p
  i=i+1;
  x(:,i)=A*y(:,i-1);
  m(i)=max(x(:,i));
  y(:,i)=x(:,i)/m(i);
  k=abs(m(i)-m(i-1));
end
a=sum(y(:,i));
w=y(:,i)/a;
t=m(i);
CI=(t-n)/(n-1);
RI=[0 0 0.52 0.89 1.12 1.26 1.36 1.41 1.46 1.49 1.52 1.54 1.56 1.58 1.59];
CR=CI/RI(n);
if CR<0.10
    disp('Yes,good!');
    disp('CI=');disp(CI);
    disp('CR=');disp(CR);
else
    disp('No,not OK!');
end
```

Figure 6: the consistency test of judgment matrix achieved by Matlab

Test results are shown in Figure 7:

```
A=[1 1/3 1/3 1/5;3 1 1 1/3;3 1 1 1/3;5 3 3 1]
Yes,good!
CI=
    0.0145

CR=
    0.0163
A=[1 1/5 1/7;5 1 1/3; 7 3 1]
Yes,good!
CI=
    0.0324

CR=
    0.0624
A=[1 7 5 9;1/7 1 1/3 3;1/5 3 1 5;1/9 1/3 1/5 1]
Yes,good!
CI=
    0.0569

CR=
    0.0639
```

Figure 7: Consistency test results

From the consistency judgment results in Figure 7 the judgment matrix built in this paper shows considerable consistency.

Based on the above obtained data and evaluation algorithm in 2.3, , by using Matlab symbolic computation we can get the athletic ability index $A_1 = 0.37274451$ 203, $A_2 = 0.627155488$ of athlete 1 and athletes 2, obviously $A_2 > A_1$, that is athlete 2's athletic ability is higher than athlete 1.

CONCLUSION

AHP well evaluates sprint athletic ability, and has been demonstrated with actual data; This paper builds a significant consistency of judgment matrix; the selected indicators also reflect a sprinter's athletic ability; The algorithms described in this article is concise, which not only can be implemented in Matlab, but also can be achieved by other software, such as C + +, VB, etc. This article evaluates two athletes, while simultaneously evaluating several athletes' athletic ability it can achieve well two. This paper describes sprinter's athletic ability by the use of AHP, meanwhile designs the weight algorithms of the judgment matrix and algorithms of the overall consistency checking, programs based on the algorithm, uses Matlab software to achieve the AHP analysis of the actual parameters for the two athletes, obtains the pros and cons of two athletes' athletic ability, and passes the consistency test.

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