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The Study on College Physical Education based on Quantity Model

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Abstract

With scientific and technological progress and development, the number of models of sports disciplines will be more and more work. Because the use of operations research and statistics, theory and method, relying on strict mathematical logic, as long as sufficient information, data reliability, model ft, solving method is accurate, the conclusions obtained on the scientific doubt. Number of models in sports disciplines in the successful application of a combination of theory and practice of the process, the theory is proven scientific theories, ad similarly, the number of well-proven model is the number of scientific models.

Keywords:physical education; quantity model; assignment problem

1.Application of Optimization Model in the Selection of Sports Talents

Optimization problems occur in different fields of sports and different aspects of sports. Therefore, operations research is always applied in sports. The author discusses the selection problem in this part.

Chinese excellent athletes are models of exercising, heroes of sports fields at home, the symbol of national prosperity and national development on the abroad. Therefore, the research for how to select outstanding sports talent has practical significance and long-term significance.

Take selection of basketball players and swimmers for examples, it simply illustrates optimization model being applied in the sports talents' selection.

1.1.The selection problem of basketball players

There are two teams playing on the 28 meters long, 15 meters wide field, who cannot predict the outcome, the final outcome often depends on many factors. However, most basketball coaches always pay attention on the height of athletes. This point is understandable: the diameter of ring is only 45 centimeters and up to 3.05 meters above the ground, the shot hit rate, blocks and rebound rate are all

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associated with the height of basketball players. Here we take the height as main objective to discuss the selection problem of basketball players.

Example 1: The coach want to select 3 official members from 6 prepared members of No. 1,2 ... ... 6 in a basketball team, which always asks their average height to be as high as possible. In addition, the selected team members is also subject to the following conditions: (1) at least one guard; (2) 2 and 5 can only selected one; (3) up to a selected center; (4) 2 or 4 selected, 6 will not be selected. The relevant information on these prepared members in Table 1, the question is which 3 players would be selected?

TABLE I. THE RELEVANT INFORMATION ON PREPARED MMERS

No. of prepared members	Position	Height(m)
1	Central	1.93
2	Central	1.91
3	Forward	1.87
4	Forward	1.86
5	Guard	1.80
6	Guard	1.85

.Solution. Set $x_j = \begin{cases} 0, & not\ select\ prepared\ players\ of\ No. j \\ 1, & select\ prepared\ players\ of\ No. j \end{cases}$ (j=1,2,3,… …6) , y is stand for the average height of three selected members.

According to the meaning, the mathematical model is

$max_y = 1/3\ (1.93xl + 1.91\ x2 + 1.87\ x3 + 1.86\ x5 + 1.86\ x6)$

$$\begin{cases} x_1 + x_2 + \dots \dots + x_6 = 3 \\ x_5 + x_6 \geq 1 \\ x_2 + x_5 \leq 1 \\ x_1 + x_2 \leq 1 \\ \\ x_2 + x_6 \leq 1 \\ x_4 + x_6 \leq 1 \\ x_1, x_2, \dots x_6 = 0\ or\ 1 \end{cases}$$

The meaning of this model is under the condition of "{"to get the maximum of y. This model refers as 0-1 integer programming model. The general solution of these problems is implicit enumeration. Follow this method of calculation steps, get the optimal solution is $(x_1,x_2,x_3,x_4,x_5,x_6)$ = (1, 0, 1, 0, 0, 1) ,the optimal value of y_{max} = 1.88 meters.

We see that the optimal solution of 6-dimensional vector, the components x_1, x_3, and x_6 are equivalent. So the conclusion should be: 1, 3 and 6 members should be selected for preparation. Optimal value illustrates that the average height of this three members is 1.88 meters.

1.2.The selection problem of swimmers

4 x 100 freestyle relay is the most interested competitive swimming by the audience. In the 50-meter swimming lane, swimmers cleave through the waves, courageously fighting. Next, we proceed from a practical example to research the selection of 4 x 100 freestyle swimming players.

Example 2: A, B, C, D are four swimmers, who swim 100 meters in various positions. Their results are in Table 2. In order to form a 4 x 100 freestyle team, how to select athletes to make the swimming relay team to get best performance?

TABLE II. 100-METER SWMMNG RECORDS (SECONDS)

Players	Backstroke	Breaststroke	Butterfly	Freestyle
A	75.5	86.8	66.6	58.4
B	65.8	66.2	57.0	52.8
C	67.6	84.3	77.8	29.1
D	74.0	69.4	60.8	57.0

Solution: Set i = 1,2,3,4, respectively represents A, B, C, D four athletes, j = 1,2,3,4, respectively represents backstroke, breaststroke, butterfly, freestyle.

$$x_{ij} = \begin{cases} 0, & i\ don't\ attend\ j \\ 1, & i\ attend\ j \end{cases}$$

y is the result of 4 x 100 freestyle team.

According to the meaning, the mathematical model of Example 2 is

Min_y = $75.5x_{ll}+86.8x_{12}+66.6x_{13}+58.4x_{l4}+65.8x_{21}+66.2$

$x_{22}+57x_{23}+52.8x_{24}+67.6x_{31}+84.3x_{32}+77.8x_{33}+59.1x_{34}+74x_{41}+69.4x_{42}+60.8\ x_{43}+57\ x_{44}$

$$\begin{cases} x_{1j} + x_{2j} + x_{3j} + x_{4j} = 1 (j = 1,2,3,4) \\ x_{i1} + x_{i2} + x_{i3} + x_{i4} = 1 (i = 1,2,3,4) \\ x_{ij} = 0 or (i, = 1,2,3,4) \end{cases}$$

The implication of this model is under the condition of "{" to get the minimum of y. This model is called assignment problem, which can adopt Hungary method to solve it. According to this method to calculate, the optional solution is

$$\begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{14} \\ x_{21} & x_{22} & x_{23} & x_{24} \\ x_{31} & x_{32} & x_{33} & x_{34} \\ x_{41} & x_{42} & x_{43} & x_{44} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

Optimal value of Y_{min} = 252.4 (s)

From the results can be seen that the optimal solution in the fourth-order matrix, the elements x14, x23, x31, x42 is equal to 1. It can be seen, selected to participate in a freestyle, B participate butterfly, C participate backstroke, D participate breaststroke, which can make freestyle get best performance, best performance is 252.4 seconds.

2.Application of regression model in predicting sporting level of college students

Relationship between socio-economic phenomena is often difficult to use certain function to describe, they are mostly random, which can find out the law by statistical observation. Regression analysis is an important way of using statistical theory to describe the correlation between random variables, which is to master the large number of observational data based on the use of mathematical statistics to establish the dependent variable and independent variable regression relationship between the function expression (called the regression formula).

2.1.Establish model

In order to scientific observe, the sports level of college students, it establish athletic performance models according the top 8 performance of spring track and field games in 2009.

Men's results as follows:

Plan / Results / Rank	100m	200m	400m	800m	1500m	5000m
First	11’’34	24’’10	54’’95	2’15’’13	4’38’’09	17’26’’89
Second	11’’73	25’’14	57’’53	2’23’’09	4’41’’31	18’34’’24
Third	11’’85	25’’37	58’’03	2’24’’38	5’00’’64	18’37’’53
Fourth	12’’27	25’’79	58’’04	2’24’’54	5’05’’34	18’39’’98
Fifth	12’’35	26’’11	58’’20	2’26’’74	5’06’’56	19’45’’48
Sixth	12’’43	26’’35	58’’30	2’27’’09	5’06’’63	19’53’’57
Seventh	12’’54	26’’47	59’’23	2’27’’78	5’07’’56	19’55’’53
Eighth	13’’55	26’’52	1’00’’34	2’29’’09	5’08’’23	20’05’’60
Mean(second)	12.27	25.75	58.05	144.73	299.34	1147.31

Women's results as follows'

Plan / Results / Rank	100m	200m	400m	800m	1500m	5000m
First	14’’59	31’’48	1’17’’94	2’57’’87	6’47’’94	14’46’’63
Second	14’’83	32’’97	1’21’’80	3’12’’30	6’48’’00	14’56’44
Third	15’’25	34’’88	1’21’’84	3’16’’99	6’51’’15	15’08’’08
Fourth	15’’35	34’’94	1’23’’15	3’17’’02	6’55’’24	15’27’’50
Fifth	15’’90	35’’13	1’24’’83	3’18’’43	6’58’’66	16’02’’09

Sixth	16’’21	35’’53	1’25’’31	3’20’’07	7’01’’26	16’10’’56
Seventh	16’’51	35’’25	1’26’’54	3’20’’08	7’03’’40	16’20’’80
Eighth	16’’59	35’’97	1’26’’54	3’23’’09	7’03’’48	17’13’’00
Mean(second)	15.56	34.51	83.44	195.84	416.4	945.63

Describing the first and the mean performance of top 8 in Cartesian coordinates, we can find the power function show increasing patter, then the results ft the following model. t = t0 + amb, where t is a refection of the time when athletes start, according to experts, the sprint about 0.18 seconds, considering the sprint to take to = 0.2 second. Long distance, m for the movement distance value for the 100m, 200m , 400m, 1500m, 3000m, 5000m.

T0 the above model to the left, both sides take to e to be the end of the natural logarithm In (t-t0) = Ina + blnm

So that tl = In (t-t0), al = Ina, ml = lnm then t1 = al + b ml

For this we use t1 ml linear regression analysis, we can get the following four models.

Men's average score model

t = 0.2 +5.1547673 x 10-2m1.179383743

Women's average score model

t = 0.2 +5.6003822 x 10-2m1.217632586

Men's champion performance model

t = 0.2 +4.9705760 x 10-2m1.173924689

Women's Champion model results

t = 0.2 +4.9328477 x 10-2m1.226833244

2.2.Statistical analysis of model

- *Men's average score*

Program	Measured	Predicted	Error	95% confidence interval
100m	12.27	11.98	0.29	[10.12 14.18]
200m	25.75	26.87	-1.12	[22.94 31.48]
400m	58.05	60.60	-2.55	[52.04 70.57]
800m	144.73	137.00	7.73	[112.68 159.48]
1500m	299.34	287.30	12.04	[245.60 336.10]
5000m	1147.31	1187.92	-40.61	[993.88 1419.86]

t1 for linear regression on the ml, the correlation coefficient r = 0.9996, residual standard deviation σ= 0.04

- *Women’s average score*

Program	Measured	Predicted	Error	95% confidence interval
100m	15.65	15.46	0.19	[14.34 16.66]

200m	24.51	35.68	-1.17	[33.26 38.27]
400m	83.44	82.72	0.72	[77.33 88.48]
800m	195.84	192.12	3.72	[179.53 205.59]
1500m	416.14	415.80	3.34	[384.59 443.08]
5000m	945.63	959.76	-14.14	[888.74 1036.45]

t1 for linear regression on the ml, the correlation coefficient r = 0.9996, residual standard deviation C = 0.02

2.3.Analysis and Forecast

- It can be seen from the above model, sports results and sports students have shown between the apparent distance of regularity. When the movement distance increases, the movement of the power function trend to increase performance significantly.
- The predicted results of four experimental results agree well with the students. Scores of students were falling 95% confidence interval, so we can track model to predict the level of students. For example: men's 100m hospital will be the best performance up to 11 "of 27, women's 100m will reach 14"22 best result, and based on the model can predict the best men's marathon 10000m score 44'50"15, Women's 5000m distance running the best result for the 28'22"82

3.Conclusion

Whether people engage in any work, regardless of what action to take, they would like to work or action by the developed program is the best, and in accordance with the best solution to achieve the most satisfactory results. Such problems often referred to as the optimization problem.

The key to solving the optimization problem: First, establish a suitable model, the practical problems into mathematical problems; Second, choose the correct and simple method, by calculation to get the optimal solution and optimal value. We can get the best program by combining optimal solution and optimal value. According to the best program, people can get to achieve the desired goal.

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