ISSN 1750-9823 (print)
International Journal of Sports Science and Engineering
Vol. 03 (2009) No. 03, pp. 157-164

Prior Research on the Regression Model of Body Moisture of University Boy Students

Zhong-hui Zhao[1, +], Jun Zhao [2]

[1] Zhejiang police institute, Hangzhou 310053, China
[2] Zhejiang shuren university, Hangzhou 310015,China

(*Received July 3, 2009, accepted August 25, 2009*)

Abstract. In this paper, height, body mass index and its indicators derived from the variables, Inorganic salt content of the body in order to target male college students as the dependent variable ,The use of scientific research methods, Create multiple regression model. Regression model using statistical parameters of a comparative analysis of, Male college students preferred to predict the optimal body content of inorganic salts regression model. Multivariate regression model predicted values and the actual measured values, In the P> 0.90 level, Showed no difference.

Key words: Male college students; The body content of inorganic salts;constitution index; Regression model; Optimization .

1. Introduction

Human body composition is one of the important branches of human biology, Major research in the human body between the various components of the number of laws, and in vivo of various factors on the number of components of the relationship between the impact and in vivo determination of body composition methods. Some countries in Europe and America, the human body composition studies are now more mature and widely used in health-care medicine, physical measurement, nutrition assessment, sports medicine. After checking the relevant literature CNKI network, Although in this research field in China there are a number of related research reports, but did not retrieve the body content of inorganic salts on the human body calculation of regression model research results.

This study based on a University of male body content of inorganic salts and physical form of indicators, and indicators of physical function and physical fitness tests ,The use of scientific research methods, establishment of a suitable inorganic salt content of the body of Male College Students regression model, Aimed at the body content of inorganic salts on the University of boys of different age groups, and other inorganic salt content of the body to provide scientific theoretical basis for the calculation.

2. Subjects and methods

2.1. Study

Randomly selected 352 male college students in school, aged 18-21 years, a total of 352.

2.2. Research Methods

2.2.1. Literature information available related literature, analysis of relevant research results of this study was to find a "breach" provide a theoretical basis.

2.2.2 .Index System test

2.2.2.1. The body composition and method of detection of targets

The use of human body composition InBody3.0 analyzer (Biospace, Korea), test instrumentation prior to correction. Detection of indicators, including body water content, protein content, fat content, salt content of the four component indicators. Pre-test requirements of subjects within 24 hours to avoid strenuous exercise

[+] *Corresponding author*. Zhong-hui Zhao. Tel: 0571-87787092.
E-mail address: zhaojun17895@163.com.

and a large amount of water. Testing subjects dressed in light clothing, paper towels prior to use saline to clean their hands and feet in order to increase the electrical conductivity of skin.

2.2.2.2. Indicators and methods of physical testing

The use of the promulgation of a national body to monitor the use of detection equipment and related equipment. Detection of indicators, including body shape, physical function, physical quality index system. The indicator system shown in Table 1.

Table 1 :The study of male college students a list of indicators of physical testing

Height	Weight	weight * 100 / height	Body volume	Body surface area	BMI	Vital capacity
Pulse	Diastolic blood pressure	Systolic blood pressure	Pulse pressure	100 meters	200m obstacle	1000 meters
5000 meters	Shot Put	Pull-up	Jump	Climbing	Direct response	Indirect response

2.2.3 . The establishment of a database

Components will be tested in human and physical testing of indicators of computer data entry, the establishment of the relevant series of studies database.

2.2.4 . Mathematical statistics

Micro Excel2000 and sports use of scientific data processing system software, the database of statistical data processing and analysis.

2.2.5. Optimization

Established based on a regression (linear and nonlinear) and multiple regression models to compare their body of Male College Students calculate the relative accuracy of the content of inorganic salts, suitable for male college students preferred inorganic salt content of the body computational model.

3. Results and Analysis

3.1. Physical inorganic salt content of male college students with physical indicators of the relevance of

Male college students in the database based on physical indicators of mineral salt contents of data and physical indicators of data, the use of Micro Excel2000 software to calculate its relevance, its calculation results in Table 2.

Table 2 : Relativity of university boy student's Moisture and constitution index system （r_{iy}）

Surface area	Weight	（weight/height）*100	BMI	Fat degree (%)	Standard weight	Height	Shot
0.8618	0.8238	0.7457	0.6215	0.6215	0.5610	0.5592	0.4271
Vital capacity	Vital capacity /Height	Vital capacity /weight	Pull-up	5000meter	100 meter	200meter obstacle race	SBP
0.3482	0.2728	-0.1752	-0.1136	0.1021	-0.0892	-0.0802	0.0661
Ten grade Jump	Indirect reaction	DBP	1000 meter	Pulse	DP	Climbing	Direct reaction
0.0548	-0.0521	0.0513	0.0472	0.0402	0.0371	0.0105	-0.0401

Note: $r_{(352-1)}$,0.05=0.105、$r_{(352-1)}$,0.01=0.137、$r_{(352-1)}$,0.001=0.175

Calculations based on Table 2 Analysis:

1) The physical inorganic salt content of male college students was highly correlated with body mass index of indicators of size of the sort is the order: body surface area, body weight, (weight / height) * 100, BMI, obesity degree (%), standard weight, height, shot put, vital capacity, vital capacity / height and vital capacity / body weight, its riy values are greater than the $r_{(352-1)}$,0.001=0.175，$p<0.001$ Level, Are very significant meaning. Therefore, one could argue that male college students with physical inorganic salt content of these indicators showed a high degree of correlation;

2) physical inorganic salt content of male college students was associated with body mass index of

indicators are: Pull-up targets, their riy =- 0.1136, larger than r $_{(352-1)}$, 0.05 = 0.105, p <0.05 level, A negative correlation, there has been significant; Therefore, one could argue that the higher content of inorganic salts in male college students body on the chin-up plays a negative impact on performance;

3) male college students with physical indicators of the body content of inorganic salts was not related to the target size of the sort is of the order: 5,000 m, 100 m, 200 m steeplechase, systolic blood pressure, 10 jump, indirect reaction, diastolic blood pressure, 1,000 meters, pulse, pulse pressure, climbing, and direct reactions, Its riy values are less than r $_{(352-1)}$, 0.05 = 0.105, p> 0.05 level, no significant meaning. Therefore, one could argue that male college students with physical inorganic salt content of these indicators was not relevant.

Comprehensive analysis of these results, the University boys physical inorganic salt content and physical indicators of some indicators showed a high degree of correlation was associated with some indicators and was not relevant. Therefore can be considered to study the physical content of inorganic salts indicators of male college students for university studies to further improve the male physique, has a certain practical value and theoretical significance.

3.2. Physical inorganic content of male college students preferred calculation model

Based on Table 2 in the college boy physical inorganic salt content and physical indicators of riy value of the size of three indicators of pre-sorted, respectively, to establish a regression calculation model. From each of the five kinds of model targets a preferred optimal regression model.

3.2.1.The establishment of a regression model and optimization

3.2.1.1. Regression Model and Optimization of body surface area

Based on indicators of student height and weight data, body surface area calculation formula (body surface area = 0.0071 * Height Weight +0.0133 * -0.1971) calculated the value of body surface area, and physical inorganic salt content of indicator data, using Micro Excel2000 software, by calculating its 5 kinds of unary regression model shown in Figure 1.

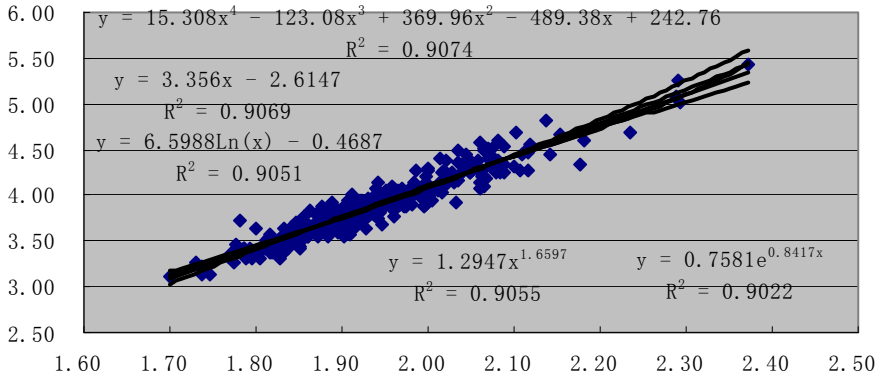

Figure 1

Figure 1 was based on finishing Table 3

Table 3:Body surface area regression model with the optimization results list

Model	Calculate Formula	R^2	Prior compositor
Linear Equation	$\hat{y} = 3.356x - 2.6147$	0.9069	2
Logarithmic Equation	$\hat{y} = 6.5988\ln(x) - 0.4687$	0.9051	4
Power Equation	$\hat{y} = 1.2947x^{1.6597}$	0.9055	3
Exponential Equation	$\hat{y} = 0.7581e^{0.8417x}$	0.9022	5
Polynomial Equation	$\hat{y} = 15.306x^4 - 123.08x^3 + 369.96x^2 - 489.38x + 242.76$	0.9074	1

Based on Table 3 of the multiple correlation coefficient (R2) value of the size of the evaluation model could be the formula for university male body calculation of the relative accuracy of the content of inorganic salts. Therefore, one could argue that one dollar in the five kinds of regression model, its predictive value of the relative accuracy of the order as follows: polynomial equations, linear equations, by the power equation, logarithmic equations and exponential equations, polynomial equation was the best.

3.2.1.2.Weight Regression Model and Optimization

Based on student body mass index and physical inorganic salt content of indicator data, using Micro Excel2000 software, data analysis, by calculating its five kinds of one dollar regression model shown in Figure 2.

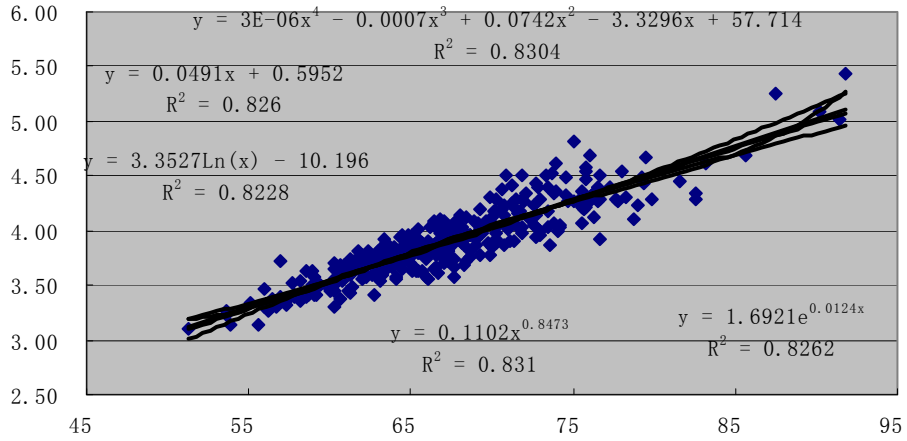

Figure 2

Figure 2 was based on finishing Table 4

Table 4:Weight regression model with the optimization results list

Model	Calculate Formula	R^2	Prior compositor
Linear Equation	$\hat{y} = 0.049x + 0.5952$	0.8260	4
Logarithmic Equation	$\hat{y} = 3.352\ln(x) - 10.196$	0.8228	5
Power Equation	$\hat{y} = 0.1102x^{0.8473}$	0.8310	1
Exponential Equation	$\hat{y} = 1.6921e^{0.0124x}$	0.8262	3
Polynomial Equation	$\hat{y} = 3E-06x^4 - 0.0007x^3 + 0.0742x^2 - 3.3296x + 57.714$	0.8304	2

Based on Table 4 in the multiple correlation coefficient (R^2) value of the size of a dollar in the five kinds of regression model, its predictive value of the relative accuracy of the order as follows: by the power equation, polynomial equations, exponential equations, linear equations and the number of equations, multiplied by the power equation was the best.

3.2.1.3(Weight / height) * 100 Regression Models and Optimization

Based on the students (weight / height) * 100 indicators and physical indicators of mineral salt contents of the data, using Micro Excel2000 software, data analysis, by calculating its five kinds of one dollar regression model shown in Figure 3.

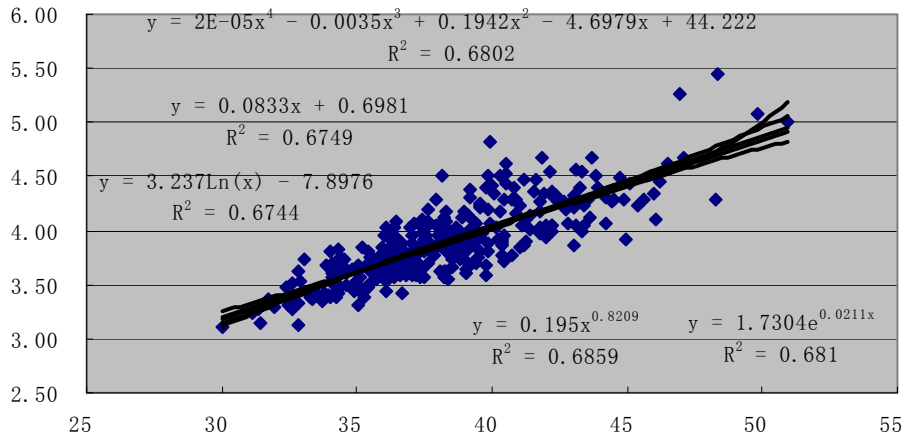

Figure 3

Figure 3was based on finishing Table 5

Table 5 :(Weight / height) * 100 list of the results of the regression model with the optimization

Model	Calculate Formula	R^2	Prior compositor
Linear Equation	$\hat{y} = 0.0833x + 0.6981$	0.6749	5
Logarithmic Equation	$\hat{y} = 3.237\ln(x) - 7.8976$	0.6744	4
Power Equation	$\hat{y} = 0.195x^{0.8209}$	0.6859	1
Exponential Equation	$\hat{y} = 1.7304e^{0.0211x}$	0.6810	2
Polynomial Equation	$\hat{y} = 2E-05x^4 - 0.0035x^3 + 0.1942x^2 - 4.6979x + 44.222$	0.6802	3

Based on Table 4 in the multiple correlation coefficient (R^2) value of the size of a dollar in the five kinds of regression model, its predictive value of the relative accuracy of the order as follows: by the power equation, exponential equation, polynomial equations, logarithmic equations and lines linear equation, multiplied by the power equation was the best.

3.2.2.The establishment of multiple regression model

Table 6: Physical inorganic salt content of male college students multivariate statistical parameter list

Index	Regression modulus b_i	Standard Regression modulus B_i'	Sum of squares of partial regression P_i	F inspection F_i
b_0	3.022123			
b_1	-1.870265	-0.5307	0.008390	0.8021
b_2	0.177802	3.2899	0.077509	7.4105
b_3	-0.194114	-1.9134	0.090224	8.6261

Note: R^2= 0.9554,Sy = 0.1023, F=1215.02 (P<0.01)

Based on Table 2 in the riy value analysis, and physical inorganic salt content of male college students showed a high degree of relevance, and there is a very significant indicators of the physical form of the main

categories of indicators are. Therefore, the purpose of this study riy values in the top three indicators (body surface area, body weight, (weight / height) * 100) as the independent variables, the body content of inorganic salts as the dependent variable, the establishment of multiple regression computing model. Since the variables and the dependent variable based on the indicator data, the use of sports science statistical processing system software, after statistical processing, and the results shown in Table 6.

Based on the regression coefficients in Table 6, the establishment of physical inorganic salt content of male college students multiple regression model:

$$\hat{y} = 3.022123\text{-}1.870265 \times \text{body surface area} + 0.177802 \times \text{weight} - 0.194114 \times (\text{weight / height})$$

Based on statistical parameter $R^2 = 0.9554$, $F = 1215.02$ analysis, the model calculated the value of male college students with physical inorganic salt content of the actual value was a high degree of correlation, $P < 0.01$ level. Therefore can be considered the model calculated values and the actual values showed no differences.

3.2.3.Optimization of Regression Model

Based on body surface area, body weight and (weight / height) × 100 indicators established by the regression model in the optimal model and the establishment of the multi-regression model and its associated indicator data involved, the use of Micro Excel2000 software, data analysis, through the programming physical inorganic salt content of calculating the value of male college students, the results shown in Table 7.

Table 7: Result of Model calculation of University students' moisture content

	Actual data		Model calculated data		Forecast data of Model Regression			
	Weight	Mineral salt	Surface area	（weight /height）*100	Surface area	Weight	（Weight /Height）*100	multi-dimensional regression
Xie Sheng	63.40	3.69	1.88	36.54	3.6813	3.7076	3.7405	3.6892
Zhang Xiaofeng	59.20	3.48	1.81	34.42	3.4571	3.4984	3.5611	3.4790
Zheng Jufeng	79.40	4.44	2.11	45.11	4.4407	4.4864	4.4469	4.4389
Cai Mingming	62.20	3.57	1.84	36.37	3.5662	3.6480	3.7264	3.5714
Chen Xuanwei	58.40	3.42	1.79	34.15	3.4001	3.4583	3.5385	3.4216
Ye Feng	66.80	3.97	1.96	37.42	3.9581	3.8754	3.8144	3.9717
Shen Zheng	69.40	3.98	1.97	39.66	3.9909	4.0028	4.0003	3.9821
Huang Yuanlong	63.80	3.79	1.90	36.15	3.7730	3.7274	3.7073	3.7871
Wang Xin	71.70	4.17	2.02	40.28	4.1624	4.1149	4.0519	4.1729
Chen Feng	72.70	4.14	2.02	41.42	4.1479	4.1635	4.1461	4.1371
…	…	…	…	…	…	…	…	…

Table 7 in the male college students based on physical inorganic salt content in the actual measurement value and predicted values, using Micro Excel2000 software, data analysis, statistical treatment by analysis of variance, and the results in Table 8.

Based on the statistical results in Table 8, the actual values and model predicted values in the selection level of 0.90, based on the analysis of F values and F crit values we can see: body surface area regression models to predict the value of $F = 0.0399379 > F_{crit} = 0.0158022$; Weight regression models to predict the value of $F = 0.0171376 > F_{crit} = 0.0158022$, $p < 0.90$; (weight / height) * 100 regression models to predict the value of $F = 0.0403794 > F_{crit} = 0.0158022$; Multiple regression models to predict the value of $F = 7.285E\text{-}09 < F_{crit} = 0.0158022$. Thus can be considered: 1) Multiple regression models to predict the value and the actual measured value, $p > 0.90$, showed no differences, the model predicted value of meaningful; 2) Body surface area regression models to predict the value of the weight regression models to predict the value of the , (weight / height) * 100 predicted value and the actual measured value, $p < 0.90$, showed there are differences, these three kinds of models to predict the value of the meaningless. In the four kinds of forecasting models, multiple regression prediction model for the optimal forecasting models, followed by: weight regression model, body surface area regression model, and (weight / height) * 100 regression model.

Table8:Regression model calculated the value of mineral salt contents of male college students with the actual physical measurement analysis of variance results list

Actual data and forecasted data of Model	origin Difference	SS	DF	MS	F	P-value	F crit	Level	p	Prior choosing compositor
Model forecasted data of Surface area	Inter- group	0.0044984	1	0.0044984	0.0399379	0.84166	0.0158022	0.90	<0.90	3
	within-group	79.070415	702	0.1126359						
	Total	79.074914	703							
Model forecasted data of weight	Inter- group	0.0018553	1	0.0018553	0.0171376	0.8958834	0.0158022	0.90	<0.90	2
	within-group	75.998517	702	0.10826						
	Total	76.000372	703							
Model and multi-dimensional regression	Inter- group	0.0040117	1	0.0040117	0.0403794	0.8407989	0.0158022	0.90	<0.90	4
	within-group	69.743295	702	0.0993494						
	Total	69.747306	703							
forecasted data of （weight /height ） *100	Inter- group	7.285E-09	1	7.285E-09	6.401E-08	0.9997982	0.0158022	0.90	>0.90	1
	within-group	79.88999	702	0.1138034						
	Total	79.88999	703							

4. Conclusion

4.1 Physical inorganic salt content of male college students and body shape, physical function and fitness-related and some of the indicators showed a high degree of Messire nature. Thus, pairs of male college students study indicator mineral salt contents of the body is a physical study of male college students to further improve and supplement, and has a certain practical value and theoretical significance.

4.2 The height and weight data and indicators measured by the height, body mass index data derived indicator data as independent variables, to the body content of inorganic salts indicators of male college students as the dependent variable to establish multiple regression model, applied to compare statistical parameters optimization, multi - Regression Model for the optimal prediction models.

4.3 In the absence of male college students tested under the conditions of the body content of inorganic salts, only tested male college students height, body mass index, using the optimal forecasting model, you can calculate the body content of inorganic salts of male college students.

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