ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 1(11): 733-735
www.allresearchjournal.com
Received: 01-08-2015
Accepted: 03-09-2015

Shalini Menon
Assistant Professor, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) India.

Sandeep Sharma
Ph.D, Research Scholar, Department of Physical Education, Guru Ghasidas University, Bilaspur (C.G.), India.

Correspondence
Shalini Menon
Assistant Professor, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) India.

Factors Associated with Basal Metabolic Rate

Shalini Menon, Sandeep Sharma

Abstract
Basal Metabolic Rate is usually expressed in terms of daily rates of energy expenditure. The purpose of the study was to find out correlation between Independent variables (Weight, Body Mass Index, Fat Free Mass, and Body Fat Mass) and Dependent variable (Basal Metabolic Rate), to study joint contribution of independent variables in estimating Dependent variable and to establish regression equation for predicting Dependent variable on the basis of Independent variables. The study was conducted on fifty male sportsmen and age ranged from 19 to 25, from basically belongs to the department of physical education from Guru Ghasidas University, Bilaspur (C.G). The statistical technique employed for this study, Pearson Product Moment method of correlation and for seeking joint contribution multiple correlation method was used. Regression equation was established for predicting Dependent variable on basis of independent variables. The level of significance was tested at 0.05 levels. There exists a significant relationship between Basal Metabolic Rate and; Fat-Free Mass($r=0.956$, $p<0.05$), Weight($r=0.934$,$p<0.05$), Body Mass index($r=0.468$,$p<0.05$), and Body Fat Mass ($r=0.741$,$p<0.05$).Significant relationship was found between criterion variables and Independent Variables i.e. ($r_{1.2345}= 0.980$,$p<0.05$).Regression equation was found fructiferous in estimating Basal Metabolic Rate on the basis of selected variables (Weight, Body Mass Index, Fat Free Mass, Body Fat Mass).

Keywords: BMR, BMI, Fat Free mass, and Body Fat mass.

Introduction
Body composition is a biological technical term used to describe the different body compartments such as lean mass, fat mass, body water and bone mass and body fat percentage thus, need to estimate body composition energy expenditure of individual or population is important because it is a major determinant of food energy requirements. It is the minimal activity of the body which maintains the functions of respiration, circulation, and secretion (7). Since Basal Metabolic Rate (BMR) constitutes about 60%to 70% of the total energy expenditure, it has been widely used as the basis of the factorial. The BMR of an individual can simply be defined as the minimum metabolic activity required to maintain life and is a major component of total energy expenditure, whether the individuals are sleeping, resting or working (9). BMR is measured under standardized resting conditions: bodily and mentally at rest, 12-14 hours after a meal and in a neutral thermal environment. However in practice it is for more difficult to achieve the conditions of 'Basal Metabolism' than it is to define them (6). Two significant developments over the last decade have influenced our understanding of energy requirements of humans and their implications in arriving at the numbers of individuals in population groups worldwide who are undernourished and do not receive adequate levels on a daily basis. The first major development has been the recommendation of the FAD/WHO/UNU Expert Consultation on Energy and Protein Requirements (1985) to (a) rely, as a matter of principle, on estimates of energy expenditure (actual or desirable) to arrive at estimates of energy requirements, and (b) to use the basal metabolic rate (BMR) factorial approach for the assessment of total energy expenditure of individuals, communities and population groups. The second advance, more recently made, has been the suggestion that nutritional anthropometric measures, more specifically the use of body mass index (BMI) could be a simple, reliable and easily obtainable objective anthropometric criterion for both the definition and diagnosis as well as an estimate of the severity of under nutrition or chronic energy deficiency (CED) in adults (8). Several

anthropometric parameters, such as body weight and height, as well as their transformations, such as BMI, show associations with BMR. The extensive analysis by Schofield (12), seemed to indicate that when BMR was plotted against weight (or height) the relationship appeared to be quadratic, cubic or of a more complicated form although there was a strong linear component.

Objective of the Study

- The objective of the study was planned with the aim to find out coefficient correlation between Dependent variable (Basal Metabolic Rate) and Independent variables (Fat-Free Mass (FFM), Weight, Body Mass Index, and Body Fatness).
- To study the joint contribution of Independent Variables in estimating Dependent Variable.
- To establish regression equation for predicting Dependent Variable on the basis of Independent Variables.

Methodology

A fifty male sportsmen acted as subjects for this study were selected from the Department of Physical Education of Guru Ghasidas University, Bilaspur (C.G.) aged ranged between 21 to25 years and 100% provided permission to use data from class project for research purpose.

Variables

Basal Metabolic Rate was considered as Dependent variable and Fat Free Mass, Weight, Body Mass Index, and Body Fat Mass considered as the Independent variables.

Test Administration

The present study was conducted by the scholar under the guidance of the expert and callipered instruments were used. The Basal Metabolic Rate, Body Mass Index, Fat Free Mass ,Body Fat Masswas measured in early morning before the actual involvement of the student in Physical activities with the help of Maltron BF907 "Body Composition Analyzer". Weight was measured using platform digital scales with a precision of 0.1 kg, and Height was recorded using a "Stadiometer" to the nearest 0.5 cm. The subjects wore light clothing and no shoes.

Statistical Analysis

For data analysis responses were expressed as mean and standard deviation. Pearson Product Moment correlation was performed to find out relationship between the Dependent variable and Selected Independent variables. Further, Multiple Correlation method was used to find joint contribution and Regression equation was established for predicting Dependent Variable on the basis on Independent Variables at $p<0.05$ was considered statistically significant. Data analysis was performed using SPSS 17.0 software under windows.

Results and Discussion

To have a feel for the data, some descriptive statistics like Mean and SD was computed for the above said variables. They are given in table -1.

Further to meet the main objectives of the present study, Pearson's Product moment correlation coefficient given in table no.2 and Multiple correlation statistical tools/techniques were computed given in table no.3.

Table 1: Mean and SD Values of BMR and Selected Independent Variable.

VARIABLE	BMR(KCL/DAY)	WEIGHT(KG)	BMI(KG/CM^2)	FFM(KG)	BODY FATMASS(KG)
MEAN	1626.4	63.44	22.27	50.88	12.60
S.D	170.45	9.55	2.41	7.21	2.65

BMR=Basal Metabolic Rate BMI=Body Mass Index FFM=Fat Free Mass

Table 2: Correlation Coefficient between Dependent Variable and Independent Variables Variables

Variables	Bmr	Weight	Bmi	Ffm	Fatmass
BMR	1	.934**	.468**	.956**	.741**
WEIGHT		1	.705**	.985**	.893**
BMI			1	.652**	.765**
FFM				1	.809**
FATMASS					1

**correlation is significant at the 0.01 level.
*correlation is significant at the 0.05 level.

The value of mean and standard deviation for all the variables is shown in table-1.

Further, the Results presented in Table-2, show the correlation coefficient of BMR with selected body composition variables along with their p-value and sample size.

The result reveled that BMR is significantly correlated with weight($r=.934, p<0.01$), BMI($r=.468, p<0.01$),Fat Free mass($r=.956, p<0.01$),Body Fat Mass($r=.741, p<0.01$). The results of different authors (14) showed consistency with findings of this study, and also suggested that height and BMI contribute roughly in equal measures to variations on BMR. This study also indicate similar finding of(Schofield, Schofield & James 1985)that concluded anthropometric parameters, such as body weight and height, as well as their transformations, such as BMI, show associations with BMR.

Table 3: Joint contribution Independent Variables (Weight, Body Mass Index, Fat-Free Mass and Body Fat Mass) in Predicting Dependent Variable (Basal Metabolic Rate).

Criterion Variable	Independent Variables	Coefficient of multiple correlation
Basal Metabolic Rate	Weight	0.980*
	Body Mass Index	
	Fat Free Mass	
	Body Fat Mass	

*correlation is significant at the 0.05 level.

Table-3 indicate that significant relationship was found between criterion variable (Basal Metabolic Rate) and Independent variables (Weight, Body Mass Index, Fat-Free Mass and Body Fat Mass) as coefficient of multiple correlation which was higher than the tabulated value as far as this sample concerned.

Regression Equation

$Y= 754.905 + 2.452X_1 + (-22.844)X_2 + 22.609X_3 + 5.939X_4$ (where, Y=Estimation of Basal Metabolic Rate; X_1= Weight;

X_2= Body Mass Index; X_3= Fat-Free Mass; X_4=Body Fat Mass)

Conclusions

Like many other studies, our work has indicated that BMR was highly magnitude of correlation in respect of Weight, BMI, FFM, and Body Fat Mass. Hense, it concluded that all these factors will be associated with the Basal Metabolic Rate.

This study will be a new addition to the earlier developed regression equation model and will be fructiferous to estimate Basal Metabolic Rate.

Reference

1. Bogardus C, Lillioja S, Ravussin E. Familial dependence of the resting metabolic rate. N Engl J Med. 1986; 315:96-100.
2. CaloriesPerHour.com. Diet and Weight Loss Tutorial. Calculating BMR and RMR. Archived from the original on 5 January 2008. Retrieved 2008, 01-26.
3. Cunningham JJ. Body composition as a determinant of energy expenditure: a synthetic review and a proposed general prediction equation. Am J Clin Nutr. 1991; 54:963-9.
4. Fukagawa NK, Bandini LG, Young JB. Effect of age on body composition and resting metabolic rate. Am J Physiol. 1990; 259:E233-8.
5. Frankenfield, David, Roth-Yousey Lori. Compher, Charlene Comparison of Predictive Equations for Resting Metabolic Rate in Healthy Non obese and Obese Adults: A Systematic Review. Journal of the American Dietetic Association. 2005; 105(5):775.
6. Garrow JS (1978). Energy balance and Obesity in Man. (2nd ed) Amsterdam, New York and Oxford: Elsevier/North Holland Biomedical Press.
7. Harris J, Benedict F. A Biometric Study of Human Basal Metabolism. PNAS 4 1918; (12):370.
8. James WPT, Ferro-Luzzi A & Waterlow JC (1988): Definition of chronic energy deficiency in adults. Report of Working Party of IDECG. Eur J Clin Nutr. 42, 969-981.
9. Lahey, F. H. and Jordan, S. M. (1921). Basal Metabolism as an Index of Treatment in Diseases of the Thyroid. Boston Med. and Surg Jour, 174: 348-358
10. Nelson KM, Weinsier RL, Long CL, Schutz Y. Prediction of resting energy expenditure from fat-free mass and fat mass. Am J Clin Nutr. 1992; 56:848-56.
11. Payne PR & Waterlow JC (1971). Relative requirements for maintenance, growth and physical activity. Lancet 2:210-211.
12. Schofield WN, Schofield C & James WPT (1985): Basal metabolic rate - review and prediction together with annotated bibliography of source material. Hum Nutr: Clin Nutr 39C, Suppl. 1, 5-96.
13. Segal KR, Gutin B, Albu J, Pi-Sunyer FX. Thermal effects of food and exercise in lean and obese men of similar lean body mass. Am J Physiol. 1987; 252:E110-7.
14. Soares MJ & Shetty PS (1988): Validity of Schofield's predictive equations for basal metabolic rates of Indians. Ind J Med Res. *S%*, 253-260.
15. Svendsen OL, Hassager C, Christiansen C. Impact of regional and total body composition and hormones on resting energy expenditure in overweight postmenopausal women. Metabolism 1993; 42:1588-91.