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## Research Article

# ASSESSMENT OF ANTHROPOMETRIC AND PHYSICAL FITNESS COMPONENTS AS PREDICTORS OF PERFORMANCE OF ATHLETES OF 800 METER RACE

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### ABSTRACT

The present study has earnestly made an attempt to explore the relationship between selected anthropometric and physical fitness variables with the performance of athletes of 800 meter race and also attempted to find out the prediction equations of playing abilities of athletes. The subjects for the present study consisted of 30 college level girls athletes 18-25 years of age. Random sampling technique was adopted to collect the required data of the subjects at the time of inter college athletic meets, coaching camps and during athletics competitions. Thirty seven anthropometric variables and six physical fitness components were selected for the study. To collect the data for physical fitness of college girls, AAHPER Youth Fitness Test (1976) was used. To achieve the objectives of the present study, the inter-correlation was calculated by product moment method and multiple correlation and regression prediction equation by Worry Do Little method. The relationship between selected anthropometric variables performance was established by computing pearson's product moment coefficient of correlation equation of performance. From the results it has been found that Weight is negatively correlated with performance whereas no relationship has been established between linear measurements and performance. Among girth measurements Shoulder, hip and thigh girths have recorded significantly negative correlation with performance. Triceps skinfold has been found positively and significantly correlated to performance among skinfold measurements. Significantly negative relationship has been found between percentage fat and lean body mass with performance among body composition variables. Flexibility has been significantly correlated to performance among the components of physical fitness. Multiple correlation of weight, hip girth, triceps skinfold, flexibility and percentage fat taken together with performance has been found significant. It can be concluded that anthropometric and physical fitness attributes effect the running performance of 800 meter race.

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## INTRODUCTION

From the earliest times running has been a natural part of man's existence. One of the earliest examples of competitive running can be found in the works of Homer, who tells of races ran in the 12th century BC. Thus, man has been racing on foot for over three thousand years (Blacklock and Kennett, 2000). It was the Greeks who elevated running to the level of their gods at Olympia, and the spectacle of athletes running and engaging in other contest of exertion to sculptor's of fertile images of human beauty. The revival of the Olympics Games in 1896 has resulted in standardization of events and competitions. The events have become all the more popular now and need scientific and structured training and practice. Ericsson's theory of deliberate practice states that the level of expertise obtained

by elite athletes is at least in part a function of the amount of structured practice. It was expected that children with a more extended training history would exhibit more pronounced anthropometric, physical fitness and motor coordination profiles matching the specific sport. Specific anthropometric characteristics are needed to be successful in certain sporting events This process whereby the physical demands of a sport lead to selection of body types best suited to that sport is known as "morphological optimization" (Bloomfield *et al.*,1995). Athletes who have (or) acquired the optimal physique for a particular event are more likely to succeed than those who lack the general characteristics (Carter, 1984). The appraisal of body composition can provide valuable information for both the athlete and coach in monitoring sequentially the influences of training and nutrition. Therefore, the determination of body composition is important in terms of

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a training plan as well as success in the game. Looking at the importance of anthropometry and physical fitness for the performance of athletes the present study has been undertaken.

### **Aim of the Paper**

The present study has earnestly made an attempt to explore the relationship of selected anthropometric and physical fitness variables with the performance of athletes of 800 meter race.

### **Objectives**

To achieve the above aim the following objectives were formulated:-

1. To find the relationship between selected anthropometric variables and performance abilities of athletes of 800 meter race.
2. To determine the correlation between physical fitness components and performance abilities of athletes of 800 meter race.
3. To determine the multiple correlation between selected anthropometric, physical fitness variables and performance abilities of selected athletes.

### **Hypothesis**

Keeping in the view the objectives, the following hypothesis have been designed:

1. There exists no significant correlation between selected anthropometric variables and performance abilities of athletes.
2. There exists no significant correlation between physical fitness components and performance abilities of athletes
3. No multiple correlation exist between selected anthropometric variables, physical fitness components and performance abilities of athletes.

### **Delimitations and Limitations of the study**

1. The present study was based on 30 college athletes of north India between the age of 18 to 25 years as the subjects.
2. The selected anthropometric variables were measured with the help of anthropometric rod, steel tape, vernier caliper and lange's skinfold calipers.
3. To measure the physical fitness of female athletes, AAHPER youth fitness test (1976) was used.
4. Body composition was calculated by using the skinfold measurements i.e. biceps, triceps, subscapular and suprailiac skinfolds only.
5. For the analysis and interpretation of data, statistical treatment was confined to correlation, multiple correlation.
6. The factor like diet, daily routine, life style, habits etc., which affect the result of the study could not be controlled.
7. Since the data was collected round the year, so the seasonal variations were out of control.
8. Since the subjects were above eighteen years of age, no correlation for growth factor was necessary.

## **METHOD AND PROCEDURE**

### **Sample of respondents**

The subjects for the present study consisted 30 college girls athletes age ranging from 18-25 years having minimum two year participating experience in the athletic competition. Random sampling technique was adopted to collect the required data of the subjects at the time of inter college athletic meets, coaching camps and during competitions. The following 33 anthropometric variables were selected for the study.

### **Independent Variables**

1. Age
2. Body weight

### **Linear Measurements**

3. Height
4. Leg length
5. Thigh length
6. Lower leg. Length
7. Trunk length
8. Total arm length
9. Upper arm length
10. Fore arm length
11. Foot length
12. Foot Breadth
13. Sitting height

### **Body Circumferences (Girths)**

14. Abdominal circumference
15. Hip circumference
16. Shoulder circumference
17. Breast circumference
18. Thigh circumference
19. Calf circumference
20. Arm circumference

### **Bones Diameters**

21. Elbow Diameter
22. Bitrochantric diameter
23. Femur bycondylar diameter
24. Ankle diameter
25. Biacromial diameter

### **Skinfold Measurements**

26. Biceps skinfold
27. Triceps skinfold
28. Subscapular skinfold
29. Superailiac skinfold
30. Thigh skinfold
31. Mid axillary skinfold
32. Calf skinfold
33. Breast skinfold

### **Body Composition Variables**

34. Body Density
35. Percentage fat
36. Fat weight
37. Lean body mass

**Physical Fitness Components**

1. Endurance
2. Strength
3. Speed
4. Flexibility
5. Agility
6. Muscular power

**Dependent Variables**

Best performance of the athletes, in their respective event, was taken as dependent variables.(Y) i.e. minimum time taken in completing 800 mts was recorded as dependent variable.

**Tools used**

1. For measuring the height and weight, the anthropometric and portable level actuated weighing machine was used.
2. A flexible steel tape was used to measure the circumferences.
3. Lange’s skinfold caliper was used to measure the different skinfolds.
4. Diameters were taken with the help of various calipers.
5. To collect the data for physical fitness of college girls, AAHPER Youth Fitness Test (1976) was used

**Statistical Design**

To achieve the objectives of the present study, the intercorrelation was calculated by product moment method and multiple correlation and regression prediction equation by Worry Do Little method. The relationship between selected anthropometric, physical fitness variables and performance by computing pearson’s product moment coefficient of correlation.

**RESULTS**

**Table 1** Relationship of Age, Body Weight and Linear Anthropometric Variables to Performance in 800 Mts. Race

Variables Correlated	Coefficient of Correlation (r )
Age and performance	.113
Weight and performance	-.364*
Height and performance	-.149
Leg length and performance	.011
Thigh length and performance	.124
Lower leg length and performance	-.143
Trunk length and performance	-.086
Sitting height and performance	-.031
Upper arm length and performance	.253
Forearm length and performance	.238
Total arm length and performance	.176
Foot length and performance	-.016
Foot breadth and performance	-.038

\*Significant at 5% level, N=31, r (29) .05 = .355

Table - 1 indicated that only body weight has been found to possess significant and negative correlation with performance in 800 mts. Run at .5% level. Others linear measurements have no significant correlation with the performance of the female athletes.

**Table 2** Relationship of Body Girth and Diameter Measurements to Performance in 800 Mts. Race

Variables Correlated	Coefficient of Correlation (r )
Shoulder Girth and performance	-.419*
Breast Girth and performance	-.320
Abdominal Girth and performance	-.248
Hip Girth and performance	-.484*
Knee Girth and performance	-.117
Thigh Girth and performance	-.442*
Calf Girth and performance	-.202
Arm Girth and performance	-.131
Elbow diameter and performance	-.125
Hip diameter and performance	-.143
Femur bycondylar and performance	-.122
Ankle diameter and performance	-.079
Biacromial diameter and performance	-.166

\*Significant at .05 level= .355

Table- 2 clearly indicates that shoulder, hip and thigh girths have been found to possess negative and significant correlation with performance on 800 meters race at 5% level, it implies that the time of finish the 800 mts. Race decreases so the performance of the athlete increases. Hence, these significantly correlated variables contribute to the performance in this age group. Other body girth and diameter variables show no significant correlation with performances.

**Table 3** Relationship of Skinfold Measurements and body composition Variables to Performance in 800 Mts. Race

Variables Correlated	Coefficient of Correlation (r )
Biceps skinfold and performance	-.017
Triceps skinfold and performance	.346*
subscapula skinfold and performance	.204
suprailiac skinfold and performance	.077
Thigh skinfold and performance	-.001
Calf skinfold and performance	.117
Mid axillary skinfold and performance	-.108
Breast skinfold and performance	-.012
Body density and performance	.212
Percentage of fat and performance	.475*
Fat weight and performance	-.170
Lean body mass and performance	-.406*

\*Significant at 5 % level= .355, N = 31, r (29) .05 = .355

From table 3 it is evident that performance in 800 mts race has significantly and positive correlated with triceps skinfold and fat percentage. Whereas lean body mass has significant and negative correlation with the performance. It means that with the increase in the triceps skinfold and fat percentage, the time taken to finish the event also increases, So, the performance decreases, whereas with the decrease in the lean body mass, the time to finish the event decreases, so the performance increases. The decrease of lean body mass contributes to the performance of the event.

**Table 4** Relationship of Physical Fitness Components to Performance in 800 Mts. Race

Variables Correlated	Coefficient of Correlation (r )
Endurance and Performance	-.074
Strength and Performance	-.078
Speed and Performance	-.157
Flexibility and Performance	.386*
Agility and Performance	-.255
Muscular Power and Performance	.262

\*Significant at 5 % level= .355, N = 31, r (29) .05 = .355

Table 4 it is obviously evident that the performance in 800 mts race has significant and positive correlation with flexibility component of physical fitness. Other components of physical fitness have no significant correlation with performance.

**Table 5** Combined Contribution of Selected Anthropometric and Physical Fitness Variables to Performance in 800 Mts. Race

Dependent (Criterion variables) (Yc)	Independent Variables (X's)	Selected Independent Variables for multiple correlation (x's)	Coefficient of Multiple Correlation (R)
Performance in 800 Mts Race	Weight (X <sub>3</sub> )	Weight (X <sub>3</sub> )	.695
	Shoulder girth(X <sub>15</sub> )	Hip girth(X <sub>18</sub> )	
	Hip girth(X <sub>18</sub> )	Triceps (X <sub>29</sub> )	
	Thigh girth(X <sub>20</sub> )	Flexibility (X <sub>39</sub> )	
	Triceps (X <sub>29</sub> )	Percentage fat(X <sub>43</sub> )	
	Flexibility (X <sub>39</sub> )		
	Percentage fat(X <sub>43</sub> )		

\*Significant at .05 level =.553, N = 31, R (25) = .553.

It is evident from table - 5 that the combined contribution of weight, hip girth, triceps skinfold, flexibility and percentage fat are significantly related to performance in 800 mts. Race as the computed value of R (.695) is more then the tabulated value of R (.553) at 5 % level with 25 degree of freedom. From obtained value of R, it is assumed that weight, hip girth, triceps skinfold, flexibility and percentage fat taken together contribute to the prediction of performance in 800 mts. race.

## DISCUSSION

From above tables it is clear that body weight has significant and negative correlation with performance. It suggests that body weight contributes to the performance at this age group. No linear measurements have significant correlation with the performance of the female athletes.

Among the girth measurements shoulder, hip and thigh girths have significant and negative-correlation with time performance which suggests that these girths contribute to the performance.

Out of the skinfolds and body composition variables, triceps skinfold and percentage fat have significant and positive correlation with the performance, which suggests that these variables do not contribute to the running performance. Since, subcutaneous tissue of triceps skinfold and more fat percentage create hindrances in the sprinting performance. Only lean body mass (LBM) has significant and negative correlation with performance, which emphasize that lean body mass tends to improve the performance of female athletes.

In physical fitness components, only flexibility has significant and positive correlation with performance in athletes of 800 Mts. race.

### Combined Contribution of Anthropometric and Physical Fitness Variables to Performance

Multiple Correlation (R=.69) of five selected anthropometric

variables with the performance of 800 Mts. race has been found to be significant at 5 percent level with Df=25. It suggests that the combined effect of the variables taken together contributes and improves the performance. So, optimum body weight, breast girth, triceps skinfold, flexibility and percentage fat are essential for better performance.

## CONCLUSION

1. Weight has negative and significant correlation with performance. Other linear measurements have no significant correlation with performance.
2. Shoulder, hip and thigh girths have negative and significant correlation with performance. Others body circumference and bone diameter measurements have registered no significant correlation with performance.
3. No diameter measurements have significant correlation with performance.
4. Triceps skinfold is found to be positively and significantly correlated to performance among skinfold measurements. Others have no correlation.
5. Percentage fat has positive and lean body mass has negative but both had significant correlation with performance. Other body compositions have no significant correlation.
6. Flexibility is found to be significantly correlated to performance among the components of physical fitness. Other components have no correlation.
7. Multiple correlation of weight, hip girth, triceps skinfold, flexibility and percentage fat taken together with performance is significant.

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