Chapter - VI

SUMMARY, CONCLUSION AND SUGGESTIONS
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The main aim of the sports scientists in all over the world, now-a-days is to locate possibilities to improve the physical fitness and performance of athletes in different games and sports. Due to the improvement in the field of research, the records have been broken at the national level as well as at the inter-national levels. Athletes are improving their fitness and performance in all the games and sports, day-by-day.

During the past century more stress has been laid on the organised games and sports in India as well as in the World. The state meets, inter-state, national and inter-national competitions in sports, like Asian games and Olympic games have created a lot-of interest in the minds of people that they have started judging the potentialities and performances of sports persons all over the World.

Indian coaches and sports scientists have shown a great interest for the improvement of physical fitness and sports performance of athletes in different games and sports. A number of steps have been taken at the state, national and inter-national level competitions to improve the performance of our athletes. Many sports scientists have investigated the role of heredity and training factors towards better fitness and performances in games and sports. According to the researchers, fitness is of three kinds i.e. anatomical, physiological and psychological. Limits of physical ability among sportsmen are determined mostly by body structure. Variations due to structure are exhibited when well trained athletes perform in competition.
Therefore, some selected anthropometric measurements, motor ability and cardio-vascular fitness are taken and studied to know the anatomical characteristics and potential limits of young school students.

**Statement of the Problem**

The problem has been stated as under:

*Relationship of Selected Anthropometric Measurements with Motor Ability and Cardio-Vascular Fitness of School Boys in the Age-Group of 13-16 years.*

**Significance of the Study**

The main problem before the coaches and physical education teachers is how to locate the best talented players and to let them know about their capabilities and potentialities. One of the main purposes of physical education is to provide individual differences among the sportsmen. This purpose can be achieved if the students are to be grouped according to their age, sex, needs and their abilities. Anthropometric measurements help physical education teachers in the classification of students into homogeneous groups for various activities.

A number of sports scientists have concluded that morphological and functional potentialities of an individual are determined by heredity to a great extent. These capabilities and potentialities put an individual within certain limits with regard to his motor performance. Several studies have demonstrated that body structure and size both are the important factors in distinguishing athletes of one sport from those of another. In this way, this study may be helpful to the coaches and physical education teachers to select the suitable player for a particular sport at the young age.

Anthropometric measurements, motor ability and cardio-vascular fitness tests will provide some norms for different age-groups of students.
which may be useful for their self appraisal and self-evaluation. This idea of norms for different age-groups may help the physical education teachers and coaches to predict motor ability and cardio-vascular fitness of the students. They may help their students to select the suitable game or sport according to their structural and functional abilities and potentialities.

**Design and Procedure**

The study was conducted on 455 male school students age-ranged between 13-16 years. These subjects were randomly selected from the following high/ higher secondary schools of Punjab:

1. Govt. Sr. Sec. School, Ghanaур, Patiala.
2. Govt. Sr. Sec. School, Ajrawar, Patiala.
5. Govt. High School, Dhamian Kalan, Jallandhar.
7. Govt. High School, Singh Pura, Ropar.
8. Govt. Sr. Sec. School (Boys), Rayya, Amritsar.

For the purpose of the present study, the following selected anthropometric measurements were taken:

1. Height
2. Sitting height
3. Weight
4. Sub-ischial length
5. Arm length
6. Leg length

*Diameters*
7. Biacromial
8. Bicristal
9. Humerus bicondylar
10. Femur bicondylar

*Circumferences*
11. Waist
12. Upper arm
13. Calf
14. Thigh
15. Chest

The relevant data pertaining to anthropometric measurements were collected with the help of anthropometer rod for height, sitting height, arm length, leg length, biacromial diameter and bicristal diameter. Sliding caliper was used for humerus bicondylar diameter and femur bicondylar diameter. Flexible steel tape was used to record the measurement of waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference. Weight was recorded with the help of portable weighing machine. Height minus sitting height provides us sub-ischial length.

**Motor Ability Test**

To measure the motor ability of the subjects, *Barrow Motor Ability test (1954)* adapted in 1957 for junior and senior high school boys, as well as for college students, was used which includes the following three motor abilities:
i) Standing broad jump  
ii) Zig-zag run  
iii) Six-pound medicine ball put

The test was administered by station to station method to the groups of 30 to 35 students. The students were given individual score cards. The test was conducted under the trained leaders. The following equipment was used to conduct this test:

1. Six pound medicine ball  
2. Measuring steel tape  
3. Stop watch (1/100 of second)  
4. Five standards or chairs  
5. Lime.

**Brief details of the three sub-tests**

1. **Standing Broad Jump:**  
   Three trials were given to each student to measure the standing broad jump. The final score was the best jump measured to the nearest inch. The test was used to measure power, strength and co-ordination.

2. **Zig-zag Run:**  
   All the students were asked to run three complete laps in the figure-of-eight. The prescribed course was 16 feet in length and 10 feet in breadth. The final score was the time recorded to the nearest tenth of the second. This test was used to measure speed and co-ordination.

3. **Six Pound Medicine Ball Put:**  
   All the subjects were asked to throw the medicine ball for three times in a succession. The ball must be put and not be thrown. The final
score was the best distance measured to the nearest foot in the three trials. The test was used to measure shoulder girdle strength, speed, power, co-ordination and balance.

**Cardio-Vascular Fitness Test**

To measure the cardio-vascular fitness of the subjects [Harvard Step Test](#) developed by Brouha and Gallagher (1943) was used. The test was developed as a sample means of discriminating between the best, average and worst with respect to general fitness. An eighteen inches high bench was used to measure cardio-vascular fitness of the subjects. The subject was asked to step up and down keeping the pace of thirty cycles in a minute with the tick of meteronom until I say stop. The exercise was done for four minutes continuously or he was asked to stop when his performance was decreased to twenty cycles in a minute.

The subject was asked to sit on the bench when the exercise was over. His pulse rate was counted for thirty second periods from one to one and one half, two to two and one half and three to three and one half minutes. The sum of the scores obtained from the three pulse counts and the duration of time of exercise were used to calculate the physical fitness index according to the following formula as given by Eckert Helen M. (1974):

\[ \text{Index} = \frac{\text{Duration of exercise in seconds} \times 100}{2 \times \text{Sum of three pulse counts in recovery}} \]

Apparatus used:

i) Stop watch

ii) Eighteen inches high wooden bench
iii) Metronom
iv) Bench or Chair

The hypotheses of the study was as follows:

i) Whether selected anthropometric measurements are good predictors of motor ability or not.

ii) Whether selected anthropometric measurements are good predictors of cardio-vascular fitness or not.

Analysis of Data

To find out the relationship of selected anthropometric measurements with motor ability and cardio-vascular fitness, multiple correlation was used. To predict motor ability and cardio-vascular fitness from selected anthropometric measurements, the prediction equation was also used. The data were analysed through the computer.

Results

The results of the present study were as follows:

Relationship Between Selected Anthropometric Measurements of All Data:

The results in Table no. 4.24 relating to the inter-correlations between anthropometric measurements were as follows:

i) Significant positive relationship was noticed between height and sitting height, weight, sub-ischial length, arm length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper
arm circumference, calf circumference, thigh circumference and chest circumference.

ii) Significant positive relationship was observed between sitting height and weight, sub-ischial length, arm length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

iii) Significant positive relationship was noticed between weight and sub-ischial length, arm length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

iv) Significant positive relationship was found between sub-ischial length and arm length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

v) Positive significant relationship was observed between arm length and leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

vi) Leg length was found to be significantly correlated with biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.
vii) Positive significant correlation was observed between biacromial diameter and bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

viii) Positive significant correlation was noticed between bicristal diameter and humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

ix) Humerus bicondylar diameter was found to be significantly correlated with femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

x) Positive significant relationship was observed between femur bicondylar diameter and waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

xi) Positive significant relationship was observed between waist circumference and upper arm circumference, calf circumference, thigh circumference and chest circumference.

xii) Upper arm circumference was found to be significantly correlated with calf circumference, thigh circumference and chest circumference.

xiii) Positive significant relationship was observed between calf circumference and thigh circumference and chest circumference.

xiv) Positive significant relationship was observed between thigh circumference and chest circumference.
All the above said results show that anthropometric measurements are significantly correlated and inter-linked with each other.

**Relationship Between Motor Abilities**

The results pertaining to inter-correlation between motor abilities i.e. standing broad jump, zig-zag run and six pound medicine ball put in Table no. 4.24 are as under:

i) Positive significant relationship was found between standing broad jump and six pound medicine ball put, but standing broad jump was found to be negatively correlated with zig-zag run.

ii) Zig-zag run was negatively correlated with six pound medicine ball put.

**Relationship Between Selected Anthropometric Measurements and Motor Ability of All Data:**

The relationship between fifteen anthropometric measurements and the three parameters of motor ability was calculated. The results shown in Table no. 4.24 from Sr. No. 16-18 are as under:

i) Standing broad jump was found to be significantly correlated with height, sitting height, weight, sub-ischial length, arm length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.
ii) Positive significant relationship was found between zig-zag run and arm length, bicristal diameter, humerus bicondylar diameter and waist circumference. Zig-zag run was negatively correlated with sitting height, leg length and biacromial diameter. But, zig-zag run was not correlated with height, weight, sub-ischial length, femur bicondylar diameter, upper arm circumference, calf circumference, thigh circumference and chest circumference.

iii) Positive significant relationship was found between six pound medicine ball put and height, sitting height, weight, sub-ischial length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference. Six pound medicine ball put was found negatively correlated with arm length.

Motor ability was found to be positively correlated with 33 anthropometric measurements and found to be negatively correlated with 3 measurements, out of 45 correlations. It is clear from the results that anthropometric measurements are positively related with motor ability in general, stands accepted.

**Relationship Between Selected Anthropometric Measurements and Total Motor Ability of All Data:**

The relationship between anthropometric measurements and total motor ability (by combining the three parameters of Motor ability i.e. standing broad jump, zig-zag run and six pound medicine ball put) in Table no. 4.24 was found to be as follows:
Total motor ability was found to be significantly correlated with height, sitting height, weight, sub-ischial length, arm length, leg length, biacromial diameter, bicristal diameter, humerus bicondylar diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

Results show that total motor ability was found to be positively correlated with all anthropometric measurements. Thus, it is clear that anthropometric measurements are positively related with motor ability.

**Relationship Between Selected Anthropometric Measurements and Cardio-Vascular Fitness of All Data:**

Cardio-vascular fitness was found to be significantly correlated with bicristal diameter. Cardio-vascular fitness was found to be negatively correlated with arm length and humerus bicondylar diameter. It was not correlated with height, sitting height, weight, sub-ischial length, leg length, biacromial diameter, femur bicondylar diameter, waist circumference, upper arm circumference, calf circumference, thigh circumference and chest circumference.

According to the above mentioned results, the cardio-vascular fitness is partially correlated with anthropometric measurements. The reasons are as under:

i) All the subjects were taken from the rural areas of Punjab state.

ii) The subjects were untrained at the time of data collection. They were not given any type of training before the data collection.
iii) The data was collected during the school time (from 8.30 a.m. to 2.00 P.M.). The temperature was very high during the summer period of schools.

**Selected Anthropometric Measurements as Predictors of Motor Ability:**

For predicting motor ability from selected anthropometric measurements, the three motor abilities i.e. standing broad jump, zig-zag run and six pound medicine ball put were taken separately and the total motor ability was also studied by combining the three motor abilities.

I. Standing broad jump was found to have a positive significant relationship with all the fifteen selected anthropometric measurements.

The prediction equation to predict standing broad jump from the selected anthropometric measurements i.e. height (x1), sitting height (x2), Weight (x3), Sub-ischial length (x4), Arm length (x5), Leg length (x6), Biacromial diameter (x7), Bicristal diameter (x8), Humerus bicondylar diameter (x9), Femur bicondylar diameter (x10), Waist circumference (x11), Upper arm circumference (x12), Calf circumference (x13), Thigh circumference (x14), Chest circumference (x15) was worked out and found to be as follows:

**Regression 1a:**
Standing Broad Jump = 23.773 - 0.310x1 + 0.544x2 + 0.801x3+ 0.516x4

`t` ratio  
(-0.646)  
(1.133)  
(0.808)  
(1.101)

- 0.173x5 + 0.318x6 + 0.696x7 - 0.471x8 + 0.999x9 + 2.396x10
  (-2.558)  
  (2.167)  
  (0.378)  
  (-2.346)  
  (1.320)  
  (-2.693)

- 0.175x11 + 0.535x12 - 0.304x13 + 0.876x14 + 0.328x15
  (-1.660)  
  (1.445)  
  (-1.741)  
  (0.005)  
  (2.386)
Results of regression 1a show that the coefficients for leg length and chest circumference were found to be positively significant and the coefficients for arm length, bicristal diameter and femur bicondylar diameter were found to be negatively correlated with standing broad jump.

Because of large number of variables there is every possibility of multicollinearity. To solve this problem the stepwise regression was also worked out and the results are as follows:

**Regression 1b (Step Wise):**

Standing Broad Jump = 0.358x1 - 1.715x10 - 0.283x11 + 0.475x15  
't' ratio (6.961) (-2.082) (-3.202) (4.970)

Regression shows that standing broad jump was found to be positively correlated with height and chest circumference but it was found negatively correlated with femur bicondylar diameter and waist circumference.

Therefore, the results of regression 1a and 1b revealed that standing broad jump can be predicted from height, arm length, leg length, bicristal diameter, femur bicondylar diameter, waist circumference and chest circumference.

**II.** Zig-zag run was found to have positive relationship with four anthropometric measurements and have negative relationship with three out of fifteen anthropometric measurements.

The prediction equation to predict zig-zag run from the selected anthropometric measurements i.e. Height (x1), Sitting height (x2), Weight (x3), Sub-ischial length (x4), Arm length (x5), Leg length (x6),
Biacromial diameter (x7), Bicristal diameter (x8), Humerus bicondylar diameter (x9), Femur bicondylar diameter (x10), Waist circumference (x11), Upper arm circumference (x12), Calf circumference (x13), Thigh circumference (x14), Chest circumference (x15) was worked out and found to be as follows:

**Regression 2a:**

\[
\text{Zig-Zag Run} = 24.491 + 0.218x1 - 0.113x2 + 0.355x3 +
\]
\[
\text{t' ratio} \quad \begin{array}{cccc}
0.026 & -0.136 & 2.074 \\
0.279x4 + 0.426x5 - 0.816x6 - 0.412x7 + 0.533x8 + &
(0.346) & (3.647) & (-3.216) & (-1.294) & (1.538) \\
0.974x9 - 0.192x10 + 0.344x11 - 0.695x12 + 0.201x13 - &
(0.745) & (-0.012) & (1.188) & (-1.086) & (0.667) \\
0.245x14 - 0.261x15 &
(-0.874) & (-1.009)
\end{array}
\]

The results of regression 2a show that the coefficients for weight and arm length were found to be positively correlated with zig-zag run and leg length was found to have negative relationship with zig-zag run.

**Regression 2b - Stepwise:**

\[
\text{Zig-zag run} = -0.318x2 + 0.545x5 - 0.494x6 + 0.820x8
\]
\[
\text{t' ratio} \quad \begin{array}{cccc}
(-2.188) & 6.287 & (-3.502) & (3.987)
\end{array}
\]

Regression shows that zig-zag run found positive significant relationship with arm length and bicristal diameter but the negative relationship was noticed between zig-zag run and sitting height and leg length.

The results of regression 2a and 2b revealed that zig-zag run can be predicted from sitting height, weight, arm length, leg length, bicristal diameter and to some extent from waist circumference (x11).
III. Positive significant relationship was found between six pound medicine ball put and almost all the selected anthropometric measurements.

The prediction equation to predict six pound medicine ball put from Height (x1), Sitting height (x2), Weight (x3), Sub-ischial length (x4), Arm length (x5), Leg length (x6), Biacromial diameter (x7), Bicristal diameter (x8), Humerus bicondylar diameter (x9), Femur bicondylar diameter (x10), Waist circumference (x11), Upper arm circumference (x12), Calf circumference (x13), Thigh circumference (x14), Chest circumference (x15) was worked out and found to be as follows:

Regression 3a:

\[
\text{Six Pound Medicine Ball Put} = -5.337 - 0.157x1 + 0.258x2 + 0.120x3 \\
\text{‘t’ ratio} \quad (-0.702) \quad (1.153) \quad (2.603) \\
+ 0.284x4 - 0.284x5 + 0.211x6 + 0.201x7 + 0.270x8 + 0.704x9 \\
(1.302) \quad (-9.013) \quad (3.087) \quad (0.234) \quad (0.289) \quad (1.996) \\
- 1.102x10 - 0.883x11 + 0.137x12 + 0.119x13 + 0.475x14 + 0.809x15 \\
(-2.657) \quad (-1.793) \quad (0.080) \quad (1.471) \quad (0.626) \quad (1.262)
\]

The results of regression 3a revealed that the coefficients for weight, leg length and humerus bicondylar diameter were found to be positively correlated with six pound medicine ball put but the coefficients for arm length and femur bicondylar diameter were found negatively correlated with six pound medicine ball put.

Regression 3b - Stepwise:

\[
\text{Six Pound Medicine Ball Put} = 0.137x1 + 0.172x3 - 0.300x5 + \\
\text{‘t’ ratio} \quad (2.882) \quad (5.398) \quad (-11.485) \\
0.196x6 + 0.862x9 - 1.005x10 \\
(2.990) \quad (3.840) \quad (-2.513)
\]
The results of stepwise regression 3b disclosed that the coefficients for height, weight, leg length and humerus bicondylar diameter were found to have positive significant relationship and the coefficients for arm length and femur bicondylar diameter were found to be negatively correlated with six pound medicine ball put.

Therefore, the results of the regression 3a and 3b described that six pound medicine ball put can be predicted from height, weight, arm length, leg length, humerus bicondylar diameter and femur bicondylar diameter.

IV. Positive significant relationship was found between total motor ability and all the fifteen anthropometric measurements.

The prediction equation to predict total motor ability from Height (x1), Sitting height (x2), Weight (x3), Sub-ischial length (x4), Arm length (x5), Leg length (x6), Biaxial diameter (x7), Bicristal diameter (x8), Humerus bicondylar diameter (x9), Femur bicondylar diameter (x10), Waist circumference (x11), Upper arm circumference (x12), Calf circumference (x13), Thigh circumference (x14), Chest circumference (x15) was worked out and found to be as follows:

**Regression 4a:**

\[
\text{Total Motor Ability} = 18.296 - 0.739x1 + 1.150x2 + 0.587x3 + 1.509x4
\]

\[
\begin{align*}
\text{'t' ratio} & \quad (-0.781) \quad (1.214) \quad (2.978) \quad (1.633) \\
-0.267x5 + 0.184x6 - 0.192x7 + 0.176x8 + 3.350x9 - 5.342x10 & \quad (-1.573) \quad (0.635) \quad (-0.530) \quad (-0.443) \quad (2.239) \quad (-3.045) \\
-0.152x11 + 0.329x12 + 0.114x13 - 0.100x14 + 0.366x15 & \quad (-0.734) \quad (0.449) \quad (0.333) \quad (-0.312) \quad (1.350)
\end{align*}
\]
Regression 4a shows that the coefficients for weight, and humerus bicondylar diameter were found to be significantly correlated but femur bicondylar diameter was found to be negatively correlated with total motor ability.

**Regression 4b - Stepwise:**

\[
\text{Total Motor Ability} = 0.656x1 + 0.661x3 + 2.544x9 - 4.427x10 \\
\text{"t" ratio} & (5.909) & (4.946) & (2.897) & (-2.693)
\]

The results of regression 4b reveal that total motor ability was found to have positive relationship with height, weight and humerus bicondylar diameter but negatively correlated with femur bicondylar diameter.

The results of regression 4a and 4b disclosed that total motor ability can be predicted from height, weight, humerus bicondylar diameter and femur bicondylar diameter.

Therefore, it may be concluded from the results of regression 1 to 4, that motor ability can be predicted from height, sitting height, weight, arm length, leg length, bicristal diameter, humerus bicondylar diameter femur bicondylar diameter, waist circumference and chest circumference.

Thus the first hypothesis whether selected anthropometric measurements are good predictors of motor ability or not stands true, because out of fifteen anthropometric measurements, ten measurements are proved to be good predictors of motor ability.

**V. Harvard Step Test** was conducted to predict cardio-vascular fitness from selected anthropometric measurements. The results of
cardio-vascular fitness test in the present study show that cardio-
vascular fitness was found to be positively significant with biacromial
diameter and negatively significant with arm length, humerus bicondylar
diameter and waist circumference.

The prediction equation to predict cardio-vascular fitness from
Height (x1), Sitting height (x2), Weight (x3), Sub-ischial length (x4), Arm
length (x5), Leg length (x6), Biacromial diameter (x7), Bicristal diameter
(x8), Humerus bicondylar diameter (x9) Femur bicondylar diameter (x10),
Waist circumference (x11), Upper arm circumference (x12), Calf
circumference (x13), Thigh circumference (x14), Chest circumference
(x15) was worked out and found to be as follows:

**Regression 5a:**

Cardio-Vascular Fitness = 76.946 + 0.756x1 + 0.183x2 + 0.182x3 -
\( t \) ratio

\[
\begin{align*}
\text{'t' ratio} & \\
(0.221) & (0.054) & (2.553) \\
0.633x4 & - 0.775x5 + 0.129x6 + 0.132x7 + 0.254x8 + \\
(-0.190) & (-15.848) & (1.239) & (0.010) & (1.781) \\
0.668x9 & - 0.219x10 + 0.298x11 - 0.588x12 - 0.169x13 \\
(1.234) & (-0.344) & (0.397) & (-2.236) & (-1.366) \\
+ 0.504x14 & + 0.338x15 \\
(0.436) & (0.345) 
\end{align*}
\]

The results of regression 5a show that the coefficients for weight
was found positively significant but arm length and upper arm
circumference were found negatively significant with cardio-vascular
fitness.
Regression 5b - Stepwise:

Cardio-Vascular Fitness = 0.159x1 - 0.748x5 + 0.302x8
ˈt' ratio (4.617) (-20.681) (3.459)

The results of regression 5b show that the coefficients for height and bicristal diameter were found to have positive significant correlation but arm length was found to have negative significant relationship with cardio-vascular fitness.

Therefore, it may be concluded that cardio-vascular fitness can be predicted from height, weight, arm length, bicristal diameter and upper arm circumference. Thus, the second hypothesis Whether selected anthropometric measurements are good predictors of cardio-vascular fitness or not is supported partially.

Conclusions:

On the basis of the results of the present study, it may be concluded that:

1. Selected anthropometric measurements are good predictors of motor ability of male school students in the age-group of 13-16 years.

2. Selected anthropometric measurements are partially supporting cardio-vascular fitness of male school students in the age-group of 13-16 years.
Suggestions:

In the light of the results of the present study the following suggestions may be given for further research in this connection:

1. Similar research work can be done on the adult male and female college and university students.

2. Similar research work can be done on school girls by female research workers.

3. More anthropometric measurements may be taken up to find out their relationship with motor ability and cardio-vascular fitness.

4. The relationship of anthropometric measurements to other components of physical fitness such as speed, strength, coordination, agility, flexibility, balance, reaction time etc. may be studied.

5. Similar research work can be done on the state level, university level and national level players in male and female sections.

6. A bigger sample of students may be taken up to confirm the results of the present study and to establish the norms.