



## **A COMPARATIVE STUDY OF ANTHROPOMETRIC PROFILE AND BODY COMPOSITION OF HANDBALL TRAINEE OF DIFFERENT AGES**

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### **ABSTRACT**

Handball is the most popular sport in India and is performed by men, children and adults with different levels of expertise. Handball performance depends upon a multitude of factors such as technical/biomechanical, tactical, mental and physiological. A set of handball players (training) comparing of 50 in number are being trained at a regular interval. 30 out of 50 players who voluntarily agreed to participate in this study have been included. They have been briefed about the study. The purpose of the study was to evaluate the different anthropometric profile & body composition of the handball trainee of different ages. Standard Statistical tools were used for generalized the fact. The study it was revealed that The body composition of the subject in terms of percentage of fat and fat mass are more compare to the value of a national players.

**KEY WORDS:** Handball, anthropometric profile, Body composition, fat percentage and fat mass.



## **INTRODUCTION**

Handball is the most popular sport in India and is performed by men, children and adults with different levels of expertise. Handball performance depends upon a multitude of factors such as technical/biomechanical, tactical, mental and physiological. One of the reasons that handball is so popular in India so that players may need to have an extraordinary capacity within any of these performance areas, but possess a reasonable level in all areas. However, there are trends towards more systematic training and selection influencing the anthropometric profiles of players who participate at the highest level. As with other activities, handball is not a science, but science may help improve performance. Efforts to improve handball performance often focus on technique and tactics at the expense of physical fitness. During a all sets of game, elite-level players jump and move many times at an average intensity close to the anaerobic threshold (80-90% of maximal heart rate). Within this Strength context, numerous explosive bursts of activity are required, including jumping, throwing, turning, changing pace, and sustaining forceful contractions to maintain balance and control of the ball against defensive pressure. Top handball players do not necessarily have an extraordinary capacity in any of the areas of physical performance. Handball training is largely based on the game itself, and a common recruitment pattern from player to coach and manager reinforces this practice. New developments in understanding adaptive processes to the circulatory system and strength performance as well as nerve and muscle adaptations to training and performance have given rise to more effective training interventions. Strength interval training using an intensity at 80-85% of maximal heart rate in 3- to 5 minute bouts have proved to be effective in the development of strength, and for performance improvements in handball play. Strength training using high loads, few repetitions and maximal mobilization of force in the concentric mode have proved to be effective in the development of strength and related parameters. The new developments in physical training have important implications for the success of handball players.

## **OBJECTIVE OF THE STUDY**

1. To evaluate the anthropometric measurement of the 19 year old handball trainee.
2. To evaluate the body composition of the 19 year old handball trainee.
3. To evaluate the anthropometric measurement of the 20 year old handball trainee.
4. To evaluate the body composition of the 20 year old handball trainee
5. To evaluate the anthropometric measurement of the 21 year old handball trainee.
6. To evaluate the body composition of the 21 year old handball trainee.



## PROCEDURE AND METHODOLOGY

**Selection Of Sites:-** After visiting researcher select 3 training club of handball in different places of Jaipur.

**Selection Of Subjects:-** A group of handball players (training) comparing of 50 in number are being trained at a regular interval. 30 out of 50 players who voluntarily agreed to participate in this study have been included. They have been briefed about the study.

**Field Data Collection:-** Following data have been collected in the applicable equipment.

1. **Age:-** The age of the subject was calculated from their date of birth and then their age in decimal fraction was calculated. It was also recorded from their record register of club.

2. **Height:-** Body height was measured by the studio-meter in cm.

3. **Body Fat and Lean Body Mass Estimation using Skin Fold Caliper:-** Skin Fold Caliper was used to measure the skin fold thickness. The skin fold measurement were taken at the specified sites that is forearm, triceps, biceps, sub-scapular, supra iliac, thigh and calf by standard procedure from the right side of the body. From the skin fold thickness, body density was calculated by using the equation proposed by Petroski. Then percent body fat was estimated from the predictive equation proposed by SIRI. Then fat mass and LBM was calculate from body weight.

$$\text{Body Density} = 1.10726862 - 0.00081201(4sT2) + 0.00000212(4sT)^2 - 0.00041761(\text{age})$$

$$\text{Where } 4sT2 = \text{supra iliac} + \text{sub scapular} + \text{triceps} + \text{calf}$$

$$4sT = \text{supra iliac} + \text{sub scapular} + \text{triceps} + \text{biceps}$$

$$\text{Percent Body Fat} = (495 / \text{body density} - 450)$$

$$\text{Fat Mass (kg)} = \text{Body Weight (kg)} [\% \text{fat} / 100]$$

$$\text{LBM (kg)} = \text{Body Weight (kg)} - \text{Fat Mass (kg)}$$

4. **Bone Mass and Percent Bone Mass Estimation using a Sliding Caliper :-** A Sliding Caliper was used to measure the bony diameters from the right side of the body. The bone width measurements were taken at some specified sites of the body that is wrist, hummers, femur and



ankle by standard protocol. After taking the measurements, bone mass was calculated by using the Mateigka Equation. After calculating the Percent Bone Mass was also calculated.

Weight of Bone :-

$$\text{Bone} = O2 \times L \times K1$$

Where, L is the height of the subject

$$K1 = 1.2 \text{ (constant)}$$

$$O = (O1 + O2 + O3 + O4)/4$$

O1 = maximum diameter of humerus bicondylar (cm)

O2 = maximum diameter of femur bicondylar (cm)

O3 = maximum diameter of wrist (cm)

O4 = maximum diameter of ankle (cm)

$$\text{Percent Bone Mass} = \text{Bone Mass (kg)} / \text{Body Weight} \times 100$$

### 5. Muscle Mass and Percent Muscle Mass Estimation using a Standard Measuring Tape:-

A Standard Measuring Tape is used to measure the circumferences from the right side of the body. The circumference measurements are taken at some specific sites of the body that is forearm, thigh and calf by standard procedure. After taking the measurements, muscle mass is calculated by using the Mateigka Equation.

Skeletal Muscle:-

$$M = R2 \times L \times K3, R = (R1 + R2 + R3 + R4)/4$$

Where, L = height of the subject (cm), R1 = corrected radius of upper arm (cm), R2 = corrected radius of forearm (cm)

R3 = corrected radius of thigh (cm), R4 = corrected radius of calf (cm), K3 = 6.5 (constant)

The corrected radius can be calculated as follows:-

$$\text{Circumference} = 2 \times (22/7) \times R \text{ Or } R = c/2(22/7) \text{ Corrected } R = [c/2(22/7) - \frac{1}{2} \text{ skin fold}]$$

$$\text{Percent Muscle Mass} = \frac{\text{Muscle Mass (kg)}}{\text{Body Weight (kg)}} \times 100$$

Body Weight (kg) × 100

### Statistical Analysis:-

The parameter studied in the present investigation was subjected to statistical analysis under students t-test (two tail), mean, standard deviation etc.



TABLE-1

A, B, C Physical characteristics of the handball trainee of three ages having under study.

Table-1A (for 19 year)

| Variables                |        |       | Range  |        |
|--------------------------|--------|-------|--------|--------|
|                          | Mean   | ±SD   | Upper  | Lower  |
| Height (cm)              | 170.32 | ±3.85 | 172.44 | 167.21 |
| Weight (kg)              | 61.33  | ±2.85 | 63.11  | 58.02  |
| BMI (kg/m <sup>2</sup> ) | 22.11  | ±0.62 | 23.01  | 20.61  |

Table-1B (for 20 year)

| Variables                |        |       | Range  |        |
|--------------------------|--------|-------|--------|--------|
|                          | Mean   | ±SD   | Upper  | Lower  |
| Height (cm)              | 171.72 | ±3.95 | 173.68 | 167.71 |
| Weight (kg)              | 62.74  | ±3.00 | 64.31  | 58.21  |
| BMI (kg/m <sup>2</sup> ) | 22.82  | ±0.67 | 23.98  | 21.01  |

Table-1C (for 21 year)

| Variables                |        |       | Range  |        |
|--------------------------|--------|-------|--------|--------|
|                          | Mean   | ±SD   | Upper  | Lower  |
| Height (cm)              | 171.98 | ±4.04 | 174.11 | 168.21 |
| Weight (kg)              | 63.11  | ±3.07 | 66     | 60.40  |
| BMI (kg/m <sup>2</sup> ) | 23.69  | ±0.72 | 24.51  | 21.11  |

**TABLE-2**

A, B, C Comparison of different Anthropometrical parameter between three ages of the player under study.

Table-2A (for 19 year)

| Variables           | Mean   | ±SD  | Range |       |
|---------------------|--------|------|-------|-------|
|                     |        |      | Upper | Lower |
| Biceps (mm)         | 12.86  | 2.20 | 13.42 | 12.05 |
| Triceps (mm)        | 14.71  | 2.30 | 15.61 | 12.86 |
| Sub scapular (mm)   | 18.81  | 2.35 | 20    | 16.40 |
| Suprailiac (mm)     | 20.96  | 2.20 | 22.14 | 18.05 |
| Lean body mass (kg) | 42.87  | 4.34 | 46.98 | 38.51 |
| Fat mass (kg)       | 14.42  | 1.75 | 16.98 | 9.78  |
| % Fat mass          | 22.87  | 1.20 | 25.43 | 16.72 |
| Bone mass (kg)      | 8.98   | 2.40 | 10.13 | 8.06  |
| % Bone mass         | 14.88  | 2.10 | 16.11 | 12.65 |
| Muscle mass (kg)    | 15.55  | 1.40 | 18    | 12.65 |
| % Muscle mass       | 26s.71 | 0.86 | 28.54 | 23.88 |

Table-2B (for 20 year)

| Variables           | Mean  | ±SD  | Range |       |
|---------------------|-------|------|-------|-------|
|                     |       |      | Upper | Lower |
| Biceps (mm)         | 13.44 | 1.67 | 15.21 | 12.56 |
| Triceps (mm)        | 14.96 | 2.35 | 15.88 | 12.45 |
| Sub scapular (mm)   | 18.92 | 2.05 | 20.81 | 16.21 |
| Suprailiac (mm)     | 21.54 | 1.34 | 20.71 | 16.11 |
| Lean body mass (kg) | 44.11 | 3.41 | 46.91 | 39    |
| Fat mass (kg)       | 14.74 | 2.15 | 19.32 | 12.65 |



|                  |       |      |       |       |
|------------------|-------|------|-------|-------|
| % Fat mass       | 23.42 | 2.85 | 25.42 | 17.56 |
| Bone mass (kg)   | 9.06  | 1.82 | 12.55 | 8.05  |
| % Bone mass      | 14.98 | 2.85 | 19.37 | 13.02 |
| Muscle mass (kg) | 16.13 | 2.80 | 19.85 | 13.65 |
| % Muscle mass    | 27.21 | 3.50 | 28.45 | 24    |

Table-2C (for 21 year)

| Variables           | Mean  | ±SD  | Range |       |
|---------------------|-------|------|-------|-------|
|                     |       |      | Upper | Lower |
| Biceps (mm)         | 13.45 | 2.30 | 15.10 | 12.85 |
| Triceps (mm)        | 15.05 | 2.35 | 16    | 13.27 |
| Sub scapular (mm)   | 19.45 | 3.04 | 22.15 | 17.45 |
| Suprailiac (mm)     | 22    | 1.65 | 24.02 | 20.60 |
| Lean body mass (kg) | 47    | 5.42 | 49.55 | 42.35 |
| Fat mass (kg)       | 14.93 | 2.11 | 16.80 | 13.15 |
| % Fat mass          | 23.84 | 2.05 | 25.85 | 20.58 |
| Bone mass (kg)      | 9.53  | 1.32 | 12.23 | 8.67  |
| % Bone mass         | 15.23 | 2.87 | 18.21 | 13.80 |
| Muscle mass (kg)    | 16.71 | 1.95 | 20.77 | 15.40 |
| % Muscle mass       | 27.76 | 2.95 | 28.82 | 24.32 |

## RESULTS AND DISCUSSIONS OF THE FINDINGS

Physical characteristics of the handball players of three ages (19 year,20 year,21 year) having under study are summarize in table-1 A,B and C. It can be seen from the table the mean value of the body weight of three ages were 61.33, 62.74, 63.11 respectively. The average heights of all three ages are 170.32, 171.72, 171.98 respectively. Similarly the average body mass indexes (BMI) of three ages were 22.11, 22.82 and 23.69 respectively. It is interesting to note as the age goes on increasing the value of all parameters mention above were increasing. This may be due to the fact the subject under study are in the growth and developmental phase. The value of BMI(kg/m<sup>2</sup>) of all the ages varies from 22.11, 22.82 to 23.69 (kg/m<sup>2</sup>).This indicate the subject under study are neither under nourished or over nourished and this value according to WHO with a cut off mark of Asian it categorized as normal.



Table 2 A, B, C represents the difference of physical parameters among three ages of player under study. The value of different variable like biceps, triceps, sub scapular and supraileac are 12.86, 14.71, 18.81, 20.96 respectively in case of age 19 years. When the above values are compare with the age of 20 year and 21 year it is found to observed that there is a increment in value of both ages. This may be due to the fact the subject under study were in the growth and developmental phase. The result of the above parameters when subjected to significant test ('t' test) the differences of all the parameters of ages are not statistically significant.

Table value of body composition of all considering the fat mass(Kg),body fat%, bone mass(Kg),bone mass%, muscle mass(Kg), muscle mass% as depicted from the same table that is table-2 A,B,C.The value of fat mass (Kg),body fat%, bone mass(Kg),bone mass%, muscle mass(Kg), muscle mass% are 14.42, 22.87, 8.98, 14.88, 15.55 and 26.71 respectively in case of 19 years and the value of above parameter in case of 20 years and 21 years are 14.74, 23.42, 9.06,14.98, 16.13, 27.21,and 14.93, 23.84, 9.53, 15.23, 16.71, 27.76 respectively. The value of all parameters though have a increasing tendency statistically they are not significant. That means the above parameters did not grow up with ages. This may be due to the fact the nutritional requirement was not adequate enough for the handball undergoing training.

## **CONCLUSIONS**

1. The present study is under taken on a group of players (handball trainee) having three different age group mainly 19, 20 and 21 years.
2. The physical report of the subject under study can be categorized as though normal as per recommendation of WHO considering the value of BMI yet for athletes communities. The gross value of height, weight should have been proportionally more.
3. The body composition of the subject in terms of percentage of fat and fat mass are more compare to the value of a national and international players. The value of bone mass and muscle mass indicate a lower value than the expected.
4. The national position of the player were not at all desired level and needs to be improved.