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## A study on lower body anthropometrics of male kabaddi players with respect to their raiding skills

**CH. Mahesh, B Sunil Kumar and Tara Singh Thakur**

### Abstract

The purpose of the study is to correlate the Lower Body Anthropometric measurements of Male Kabaddi players in the age group of 18 to 23 years with their raiding abilities. To serve the purpose of the study, a sample of 40 male Kabaddi players pursuing Graduation in Technology and Engineering were selected with the criteria being that they have been participating in Inter-College tournaments for at least past three consecutive years and the age of the individuals range from 18 years to 23 years were taken. The lower body anthropometrics taken for the study were Upper Leg length, Hip circumference, Thigh Circumference and Calf Circumference and the tests conducted for testing the raiding skills of the players were On-the-spot Bonus Test, Side Target Kick Test & Leg Thrust Reach Ability Test. Results obtained during the study showed that On-the-spot bonus ability and Leg Thrust ability of male Kabaddi players are directly proportional to their Hip circumference and Side target kick ability of male Kabaddi players is directly proportional to their Thigh circumference and to some extent dependent on the upper leg length.

**Keywords:** Anthropometrics, raider, leg thrust, circumference

### 1. Introduction

Kabaddi is one among the most popular and upcoming team games in the world. It is well known about the inception and history of Kabaddi from India and familiar to the entire world today. Kabaddi is a body contact game which involves a higher degree of emotional reactions and need for stability and training in that aspect. Equally, it requires appropriate level of Physical training.

Anthropometry is a term used for measurement of human body parts through various dimensions like bones, fat and muscle. It plays a vital role in determination of a human's abilities, talent and scope for achieving higher standards. Anthropometry is a key determinant in Sports Training and Coaching. In the game of Kabaddi, physical and physiological aspects such as Strength, Power, Endurance, Vital Capacity, Flexibility and Agility play an important role in successful performance of Kabaddi players.

A successful raider is a combination of Physical fitness, emotional stability, training and technique. The skill of raiding in Kabaddi involves a player's ability to use proper techniques and best of his physical capacities in scoring from the opponent's court.

The purpose of the study is to correlate the Lower Body Anthropometric measurements of Male Kabaddi players in the age group of 18 to 23 years with their raiding abilities.

### 2. Materials and Methods

To serve the purpose of the study, a sample of 40 male Kabaddi players pursuing Graduation in Technology and Engineering were selected with the criteria being that they have been participating in Inter-College tournaments for at least past three consecutive years and the age of the individuals range from 18 years to 23 years were taken.

**2.1 Lower Body Anthropometrics:** The following anthropometric measurements of lower body were taken for the study

1. Upper Leg length
2. Hip circumference

3. Thigh Circumference
4. Calf Circumference

### 2.1.1 Upper Leg Length

The SP sits straight on the measuring box with the right knee bent at a 90 degree angle. The small sliding caliper is positioned as if one were to measure the breadth of the patella. The blades of the caliper are positioned against the distal end of the femur on either side of the patella. The horizontal bar of the caliper should be touching, or close to the anterior surface of the thigh, proximal to the patella. Using the superior edge of the horizontal bar of the caliper as a guide, mark a line on the anterior surface of the thigh. The steel measuring tape is placed at the inguinal crease which is easily located if the hips are in a sitting position. No pressure is to be applied at the inguinal crease; however, folds of fat tissue may have to be lifted on some obese SP's to measure at the crease. The exam gown should be lifted and the pants slightly pulled to smooth out gathers. The tape is extended along the midline of the thigh to the line just proximal to the patella. The length of the upper leg is called to the recorder and the examiner also makes a (+) at the midpoint of the thigh with the cosmetic marker. This point will be used at a later time for the thigh circumference and the thigh skinfold.

### 2.1.2 Hip Circumference

The SP stands erect with feet together and weight evenly distributed on both feet. The SP is holding up the examination gown. The recorder stands in back of the SP and gathers the side seams of the exam pants together above the hips and places the thumb in the fabric to make a fold. The recorder holds the folded sides of the pants snugly while the examiner squats on the right side of the SP and places the measuring tape around the buttocks. The tape is placed at the maximum extension of the buttocks. The recorder then adjusts the sides of the tape and checks the front and sides so that the plane of the tape is horizontal. The zero end of the tape is held under the measurement value. The tape is held snug but not tight. The examiner takes the measurement from the right side and calls it to the recorder.

### 2.1.3 Thigh Circumference

The SP is standing with the right leg just in front of the left leg and the weight shifted back to the left leg. This instruction should be demonstrated by the examiner. The edge of the examining table may be used for the SP to hold onto to maintain his balance. The examiner stands on the SP's right side and the measuring tape is placed around the mid thigh at the point that is already marked by a (+). The tape is positioned perpendicular to the long axis of the thigh with the zero end of the tape held below the measurement value. The tape rests firmly on the skin without compressing the skin. The recorder checks to make sure the tape is positioned correctly. The thigh circumference is measured to the nearest 0.1 cm.

### 2.1.4 Calf Girth

Girths are circumference measures at standard anatomical sites around the body. This girth measurement is usually taken on the right side of the body. The subject stands erect with their weight evenly distributed on both feet and legs slightly apart. The measurement is taken at the level of the largest circumference of the calf. The maximal girth is not always obvious, and the tape may need to be moved up and down to find the point of maximum circumference. When recording,

you need to make sure the tape is not too tight or too loose, is lying flat on the skin, and is horizontal. It may help to have the subject stand on a box to make the measurement easier.

## 2.2 Raiding Skill Tests

In order to test the raiding ability of the players the following skill tests were administered

1. On the spot Bonus Test
2. Side Target Kick Test &
3. Leg Thrust Reach Ability Test

### 2.2.1 on the Spot Bonus

#### Purpose

The purpose of the test was to measure the ability of spot bonus ability of the Kabaddi player.

#### Facilities Required

A half Kabaddi court.

#### Equipment

Measuring tape, stop watch, marking powder and score sheet

#### Marking

Lay out of half size Kabaddi court was essential. There was a foot marking in the bulk line. Another two foot marks were marked beyond and close to the bonus line with fifty centimeters gap between two marks and centered with the mark on the bulk line.

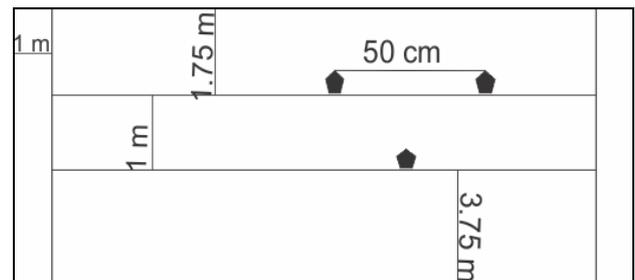


Fig 1: Marking for On the Spot Bonus Test

#### Procedure

The players were asked to stand on the marking on the bulk line. On the signal the player was asked to move the leg (right or left) and touch the marked area in the bonus line alternatively up to thirty seconds.

#### Scoring

The total number of touches by the player was considered as score. Three trials were given to all the players. The best score was considered as final score.

### 2.2.2 Side Target Kick

#### Purpose

The purpose of the test was to measure the speed kicking ability of the Kabaddi player.

#### Facility Required

A place of 10 X 5 meters dimension.

#### Equipment

Measuring tape, a ball, marking powder, hanging device, stop watch and score sheet

#### Marking

The starting line was marked with the two meters width.

Another two lines were marked from the starting line with the distance of six and seven meters with two meters width. The hanging device was placed at the centre of the line which was marked with the seven meters distance from the starting line. The ball was kept as hanging position with height of one meter from the floor and one meter projected towards the starting line.

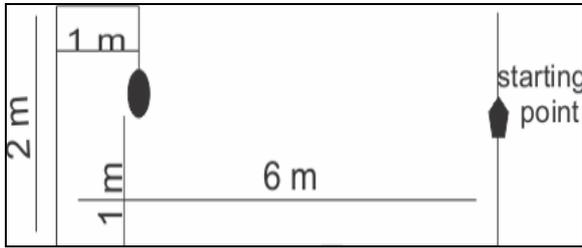


Fig 2: Marking for Side Target Kick Test

**Procedure**

The players were asked to stand in the starting line. When the signal given by the investigator the player asked to run side wards and kick the ball which hanged and return the starting line three times.

**Scoring**

The nearest time was recorded in seconds as score from starting to finish. Three trials were given to all the players. The best score was recorded as final score.

**2.2.3 Leg Thrust Reach Ability**

**Purpose**

The purpose of the test was to measure foot reach ability of the kabaddi player.

**Equipment**

Measuring tape, marking powder and score sheet.

**Marking**

There was a line with two meters length. Another line was drawn which was perpendicular to the previous line and marked in centimeters up to three meters.

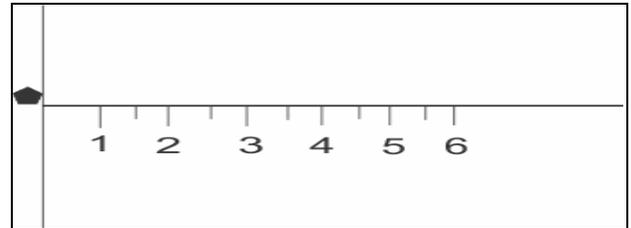


Fig 3: Marking for Leg Thrust Reach Ability Test

**Procedure**

The players were asked to sit in crouch position on the two meters line by facing his back to the three meters line. Heel part of the foot of the player was touching the line. Then the player extends his one foot back side and reaches the maximum length on the perpendicular line with the torso straight.

**Scoring**

The distance between the heel of the front foot and big thumb of the rear foot was recorded as score. And the leg length was measured and deducted from the measured score. Three chances were given to all the players and the best one was recorded as final score.

**3. Data Analysis & Results**

Table 1: Showing mean and standard deviation of lower body anthropometrics

| S. No | Variable            | Mean (cm) | SD    |
|-------|---------------------|-----------|-------|
| 1     | Hip Circumference   | 94.07     | 5.836 |
| 2     | Upper Leg Length    | 38.07     | 2.186 |
| 3     | Thigh Circumference | 51.57     | 4.135 |
| 4     | Calf Girth          | 36.07     | 2.520 |

Table 2: Showing mean and standard deviation of raiding skill tests scores

| S. No | Test                          | Mean  | SD    |
|-------|-------------------------------|-------|-------|
| 1     | On the spot Bonus Test        | 26.50 | 3.960 |
| 2     | Side Target Kick Test         | 4.065 | 0.246 |
| 3     | Leg Thrust Reach Ability Test | 81.50 | 5.949 |

Table 3: Regression analysis of on-spot bonus versus hip circumference, upper leg length, thigh circumference and calf circumference

| Source                   | DF | Adj SS | Adj MS | F-Value | P-Value |
|--------------------------|----|--------|--------|---------|---------|
| Regression               | 4  | 89.12  | 22.28  | 1.54    | 0.271   |
| Hip circumference (cm)   | 1  | 70.64  | 70.64  | 4.88    | 0.055   |
| Upper leg length (cm)    | 1  | 35.24  | 35.24  | 2.43    | 0.153   |
| Thigh circumference (cm) | 1  | 16.54  | 16.54  | 1.14    | 0.313   |
| Calf circumference (cm)  | 1  | 57.76  | 57.76  | 3.99    | 0.077   |
| Error                    | 9  | 130.38 | 14.49  |         |         |
| Total                    | 13 | 219.50 |        |         |         |

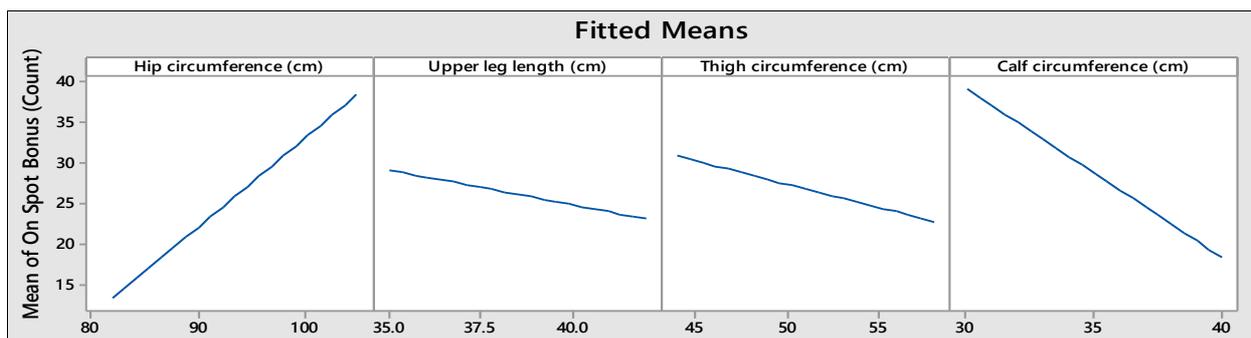


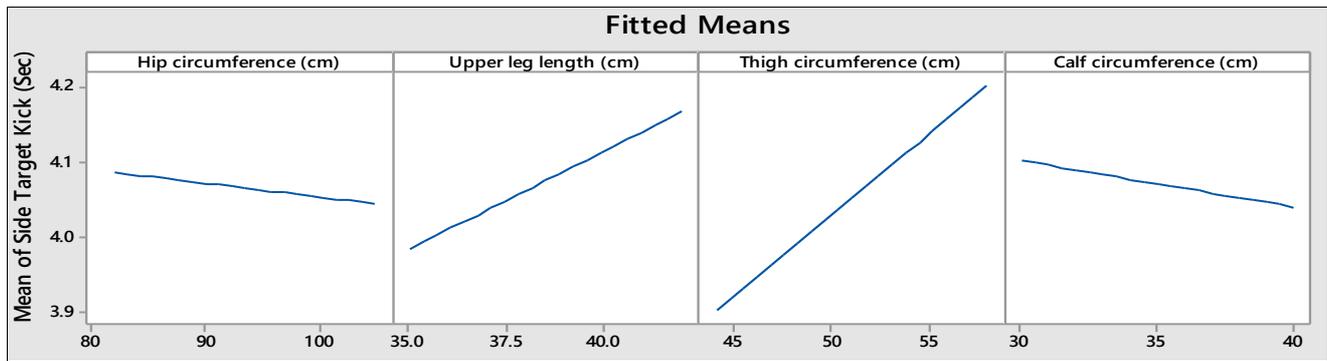
Fig 4: Main effects plot for on spot bonus (court)

It is evident from the above analysis and plot that the on the spot bonus ability of male Kabaddi players is directly proportional to their Hip circumference and the other

anthropometric measurements namely Upper leg length, Thigh circumference and Calf circumference have no impact over bonus making ability of male Kabaddi players.

**Table 4:** Regression analysis of side target kick versus hip circumference, upper leg length, thigh circumference and calf circumference

| Source                   | DF | Adj SS   | Adj MS   | F-Value | P-Value |
|--------------------------|----|----------|----------|---------|---------|
| Regression               | 4  | 0.064534 | 0.016133 | 0.18    | 0.940   |
| Hip circumference (cm)   | 1  | 0.000198 | 0.000198 | 0.00    | 0.963   |
| Upper leg length (cm)    | 1  | 0.033079 | 0.033079 | 0.38    | 0.553   |
| Thigh circumference (cm) | 1  | 0.023580 | 0.023580 | 0.27    | 0.616   |
| Calf circumference (cm)  | 1  | 0.000515 | 0.000515 | 0.01    | 0.940   |
| Error                    | 9  | 0.785216 | 0.087246 |         |         |
| Total                    | 13 | 0.849750 |          |         |         |



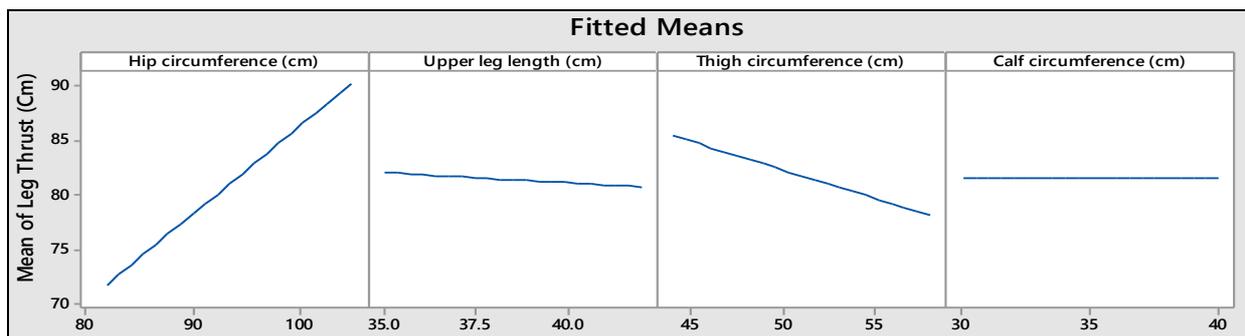
**Fig 5:** Main effects plot for side target kick (court)

It is seen from the above analysis and plot that the Side target kick ability of male Kabaddi players is directly proportional to their Thigh circumference and to some extent dependent on the upper leg length but the other anthropometric

measurements namely Hip circumference and Calf circumference have no impact over Side target kicking ability of male Kabaddi players.

**Table 5:** Regression Analysis of Leg Thrust versus Hip circumference, Upper leg length, Thigh circumference and Calf circumference

| Source                   | DF | Adj SS  | Adj MS  | F-Value | P-Value |
|--------------------------|----|---------|---------|---------|---------|
| Regression               | 4  | 136.592 | 34.1479 | 0.86    | 0.525   |
| Hip circumference (cm)   | 1  | 38.838  | 38.8385 | 0.97    | 0.349   |
| Upper leg length (cm)    | 1  | 1.754   | 1.7541  | 0.04    | 0.839   |
| Thigh circumference (cm) | 1  | 13.999  | 13.9990 | 0.35    | 0.568   |
| Calf circumference (cm)  | 1  | 0.000   | 0.0000  | 0.00    | 1.000   |
| Error                    | 9  | 358.908 | 39.8787 |         |         |
| Total                    | 13 | 495.500 |         |         |         |



**Fig 6:** Main effects plot for leg thrust (CM)

It is evident from the above analysis and plot that the Leg Thrust ability of male Kabaddi players is directly proportional to their Hip circumference and the other anthropometric measurements namely Upper leg length, Thigh circumference and Calf circumference have no impact over leg thrust ability of male Kabaddi players.

**4. Discussion**

From the results which were obtained during the study it is

seen that On-the-spot bonus ability of male Kabaddi players is directly proportional to their Hip circumference, Side target kick ability of male Kabaddi players is directly proportional to their Thigh circumference and to some extent dependent on the upper leg length and Leg Thrust ability of male Kabaddi players is directly proportional to their Hip circumference. These results may be due to the fact that Hip circumference and the strength of the Gluteus muscle plays an important role in the lower body strength, mobility and the flexibility. The

results also reveal that the lower body anthropometrics have a prevalent impact on raiding abilities of male Kabaddi players which may also apply to the female Kabaddi players.

## 5. Conclusions

The study concludes that

- The lower body anthropometrics of male Kabaddi players are key criteria for determining their raiding abilities.
- Hip circumference of male Kabaddi players provides strength and flexibility which supports them in raiding successfully with higher range of flexibility.
- Thigh Circumference of male Kabaddi players also plays an equivalent role in their raiding ability as quadriceps and hamstring muscles are key factors in determination of explosive strength and speed of a player.
- Upper leg length supports better raiding skills of male Kabaddi players.

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