# COMPARITIVE STUDY OF ANTHROPOMETRIC MEASUREMENT AND BODY COMPOSITION BETWEEN UNIVERSITY HANDBALL AND BASKETBALL PLAYERS

**A Dissertation submitted to**

**Lovely School of Physical Education**

In partial fulfilment of the requirement for the award of degree of

**Master of Physical Education**

**By**

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**PHAGWARA, PUNJAB (INDIA)**

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## Declaration

I do hereby declare that the dissertation entitled **"COMPARITIVE STUDY OF ANTHROPOMETRIC MEASUREMENT AND BODY COMPOSITION BETWEEN UNIVERSITYB HANDBALL AND BASKETBALL PLAYERS"** submitted in partial fulfiment of the requirement for the award of the degree of Master of Physical Education is entirely my original work and all idea and references have been duly acknowledged. It does not contain any work that has been submitted for the award of any other degree or diploma of any university.

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# Certificate

This is to certify that Gurpal Singh has completed his dissertation entitled **"COMPARITIVE STUDY OF ANTHROPOMETRIC MESUREMENT AND BODY COMPOSITION OF UNIVERSITY HANDBALL AND BASKETBALL PLAYERS"** under my supervision and guidelines. To the best my knowledge, the present work is the result of his original study and investigation. Any part of the dissertation has not been submitted for any other diploma or degree to any other university. The dissertation is fit for submission for the partial fulfilment of the requirement for the award of master's degree.

**(Mr. Tashwinder Singh)**

Assistant professor and Advisor

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Date:

# Acknowledgement

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# Abstract

Present study conducted to find out the different between Handball and Basketball players on their selected anthropometric variable (40) Handball and Basketball players interuniversity player between the age group of 18-25 year from Lovely Professional University Phagwara were selected for this further the subject was divided and two groups comprises of 20 subject in each group. Anthropometric measurement were measured according to Harpendan procedure by using standardize tools. The body composition i.e. lean body mass and fat percentage using the formula of Durnin and Womersley (1974). Weight and height calculated by using weight machine and anthropometric rod. Statistically 't' test was use to find out significance between both group. It is conducted Handball Players are smaller and heavier as compare to Basketball players. Insignificance difference was observed on the variable height and fat percentage between Handball and Basketball players.

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# CHAPTER 1

# INRODUCTION

# INTRODUCTION

Anthropometry literally meaning measurement of human in physical anthropology refers to the measurement of the human individual for purpose of understanding human physical variation. Today anthropometry plays an important role in individual design, clothing design, ergonomics and architectures where stoical data body about the distribution of body dimension in the population are used to optimize product. Changes in life style nutrition and ethnic composition of population lead to change in the distribution of body dimension e.g. the obesity epidemic and require regular updating of anthropometric data collections. He savant Alphonse Bertillon gave his name in 1883 to a system of identification depending on the unchanging charter of cretin measurement of part of human frame. He found by patient inquiry the servable measure of physical feature along with dimension of cretin bone or bony structure in body remains fairly content throughout adult life. He conclude that when these measurement where made and recorder systematically every single individual would be found to be perfectly distinguishable from others. The system was soon adapted to police method when crime fighter found value in being able to fix person identify. It prevented false impersonation and brought home. Francis Galton was a key contributor as well and it was in showing the redundancy of Bertillon's measurement that he develops the statistical concept of correlation. Bertillon's goal was to use anthropometry as a way identifying recidivist what we would today call repeat-offence criminals. Bertillons hope was that through the use of measurement of the body all information criminal could be reduce to a set of identifying no in set large into filling system. Bertillon also envisioned as system has been organized in such a way that even if the number of measurement was limited the system could drastically reduce the number of potential matches through an easy system of body part and characteristics being able as small, medium, and large and the size of foot was known. Anthropometry however gradually fell into disfavor and it has been generally supplanted by the superior system of finger print. The identification of body characteristics in a sports modality contribute to its success and enable to spot difference among athletes of different modalities which is of great interest for sport coaches, player and scientists. Sports performance based in a

complex and intricate diversity of variables, which include physical conditions psychological, anthropometrical and body composition factors. Anthropometry is the study of measurement of the human body in term of the dimension of bone muscle and adipose tissue. Much of measuring information presently normally use comes from information no heritable by manual measuring of a sample of the population nearly fifty years agony. Enhancements in diet and health care in recent year have resulted in a rise within the average size of the population, therefore creating the fifty years previous information redundant. Recent survey conducted by a people and USA and different have and endeavored to remedy this example however are hampered by the shortage of an acceptable methodology of feat dense, correct three dimensional information from the full physical body quickly and effectively. Manual technique, that involve the employment of calipers and measure tapes, ar very slow and expensive, turn out spare information and nearly not possible to alter. Since the appearance of 3D image capture technology there has heap of interest within the application of technology of the measuring of the physical body and therefore the goal is currently to develop a 3D image capture system capable of habitually providing dense correct mensuration information.

The motivation behind anthropometry is to guide configuration measuring to fit individuals. As configuration turn out to be more advanced, it has turned out to be perceived that item unobtrusively relies on upon convenience and additionally on conventional properties like a strength and style. The different measurements that clients cooperate with in an item are a critical piece of ease of use affecting attributes for example grasp achieve solace and manipulability.

The capacity of human body to adjust can make even gravely miss-estimate item appears to be sufficiently useable yet as experience has developed it has turned out to be evident that aggregate injury RSI sorts harm can rise as a result of miss-fitting item and that client fulfillment is constantly higher for ergonomically stable item then for others. It is the contrast between being anything but difficult to utilize and simply conceivable to utilize. Ease of use turn out to be especially critical if use is to be serious, or if clients if need to utilize the item themselves.

It is almost impossible to imagine, in the abstract, what is like to be a different size to be how one is so for example a designer who is young, big and male will always need external help in sizing object for old small or female user.

A typical confuse has been to outline for 'the normal' in the conviction that this will for the most part give the best tradeoff for settled size measurements. In certainties this is at times valid by and large, individuals who are enormous will have more trouble than the individuals who are little or the other way around.

Another frequent mistake is o base sizing on one or two individuals often people who are influential in the organization**. This creates three source of error:**

- Individual generally in their extents so that a tall man may have for instance long legs and short back. In the event that you utilize such a man to choose an auto rooftop tallness you will wind up with a rooftop that is too low.

- The individual may not speak to the client by any means. Fruitful individuals as gathering are taller and less fatty than the populace in general and this pattern to predisposition many plan toward fitting taller individuals superior to anything they do shorter individuals.

Individual subjective outline settling on can likewise bring about basic leadership making items that don't fit themselves by working in a slump or some other versatile stance. We have measured seat that don't fit any one whatsoever, by barring tall individuals in a few measurements and short individuals in other.

**The answer to three problem is objectivity,** but the development of objective data trend to be slower and less attractive process than the subjective method. One of the reason that sizing is so often approximated is the sheer time and effort it takes to find data:

• Paper sources are inclined to being misplaced or credited and tables of information frequently do not have the specific measurement or populace required.

• Few individuals are at home with table of numerical information and as a gathering innovative originator especially are repulsed by them.

• Consulting served wellsprings of information every now and again delights uncountable contrast in probably indistinguishable measurement, making, vulnerability that is capable incentive to utilizing anthropometry to all.

• Sometimes the information are there yet masked by darken restorative phrasing.

• Any comprehensives paper information source has fundamentally to be huge and ease back to look

• In the drive to tackle the numerous different issues required in plan a brisk subjective choice on measuring that appears non-basic and judgment skills can show up totally sensible. Be that as it may, to do as such is to hazard putting away issues and aggressive weaknesses for what's to come.

Human studies (from the Greek word ANTHROPOLOGIA) comprises of the investigation of mankind (see variety homo). It is all encompassing in two detects: it is worried with all human at untouched and with all measurement of mankind. Central to anthropology is the concept of culture and that our species has involved a universal capacity to conceive of the word symbolically, to teach and learn such symbol socially and to transform the world and (ourselves) based on such symbols. In the United States, anthropology in traditionally divided in to four field:

.• Physical social science that study primate behavior, human analysis, and population genetics; this field is additionally generally known as biological social science.

• Cultural social science, (called socio social science within the uk and grasp usually called socio-cultural anthropology). Areas study by cultural social scientist embody social networks, social behavior, kinship patterns, law, politics, ideology, religion, beliefs, pattern in production and consumption, exchange, socialization, gender, and different expression of culture, with sturdy emphases on the importance of field work, i.e. living among the group being studied for Associate in Nursing extended amount of your time.

• Linguistic social science, that studied variation in languages across time and house, the social uses of languages and also the relationship between languages and culture.

• Archeology that studies the fabric stay of human societies. archaeology itself is often treated as spar rate (but related) field within the remainder of the globe though closely associated with the social science field of fabric culture, that deals with physical objects created or used inside a living or past cluster as medium of understanding it cultural values. More recently some anthropology programs began dividing the field into two, one emphasizing the humanities and critical theory, the other emphasizing the natural sciences and positivism.

## OBJECTIVE OF THE STUDY

1. To determine and compare the height of male handball and basketball players in lovely professional university phagwara, Punjab.
2. To determine and compare the weight of male handball and basketball players in lovely professional university phagwara, Punjab.
3. To determine and compare the body mass index of male handball and basketball players in lovely professional university phagwara, Punjab
4. To determine and compare the skin fold caliper of male handball and basketball players in lovely professional university phagwara, Punjab.

## DELIMITIATIONS

1. The study was delimited on handball and basketball players.

2. The study was delimited to the handball and basketball players age between 18-25 years.
3. The study was delimited to 40 male subjects of Lovely Professional University Phagwara Punjab.

## HYPOTHESIS

1. There was significance difference between handball and basketball players on the variable in height.
2. There was significance difference between handball and basketball players on the variable in weight.
3. There was significance difference between handball and basketball players on the variable in fat parentage.
4. There was significance difference between handball and basketball players on the variable in body mass index.

## SIGNIFICANCE OF THE STUDY

The game basketball and handball are considered as game which is the mixture of aerobic and anaerobic i.e.80% to 90% anaerobic and 10% to 15% aerobic, which shows that it is dominantly anaerobic in nature but in order to maintain anaerobic nature a player has to run approximately 4 to 5 km/per match so it becomes necessary that players must process good endurance. Superior endurance also ensure high quality of execution which find expression in accuracy, precision, rhythm, constancy etc, under fatigue condition Endurance i.e. directly or indirectly has high importance in the all sports it is primarily determined by energy liberation process successful performance in endurance process.

On the basis of above discussion it is predicated by the research scholar that even the basketball and handball game have many senilities but among the players have still a important issue where need some scientific investigation. So the research scholar selected this problem for present research.

# CHAPTER-II

# REVIEW

# OF

# LITRATURE

# CHAPTER II

# REVIEW OF LITRATURE

**Wan Nudri WD1 (1996)** Anthropometric measurement and lean body mass of selected national athlete. The study was directed to focus the anthropometric estimation and body organization of chose national competition. A sum of 24 male competitor from 10 professional sports or game and 24 male competitor 5 sorts of games were contemplated. The structure or body weight were measured utilizing the SEGA measuring offset with tallest connection. Skinfold thickness estimation were taken utilizing the Harpenden Caliper at 4 locales biceps triceps subscapular and superalic. Rate of muscle to fat ratio was computed from the entirety of four estimation of skinfold thickness. Taking into account body mass file BMI the majority of the male 68 subject or 81% and female 19 subject or 79% competed were delegated ordinary. The male and female competitor likewise has lower rate of muscle to fat quotients when contrasted with non-competitor, however these competitors has marginally higher rate of muscle to fat quitrents when constructed with those in choose nation.

**Sidhu, J. S (2009)** Compared the anthropometric characteristics among 100 boxer and 100 athlete the age from 15 to 20 year. The sample are selected from different colleges of Punjab. The result was found the boxer are larger bigger and heavier than of an athlete's however the significant difference were noted in the chest circumference among the two groups. Boxer have more subcutaneous fat in the biceps region triceps and calf compared then the athlete group but in statically sense it is significant only in the region of triceps and calf. However comparison has also made athlete and boxer of senior and junior category by dividing the sample into two age group i.e. 15-20 and 20-25 year.

**Tiwari (2009)** focus on compression of the anthropometric variables of Indian basketball players. The subject were ninety players from different university. The subject were ranging from 17-32 years of age depending upon the level of participation subject were divided into three groups such as beginner, the intermediated and the advance group. The selected anthropometric variables were upper arm length, forearm length, sitting height, leg length structure and percentage of fat. One-way analysis of

variance ANOVA was employed to check the variability of selected groups. Post-hoc least significant difference test was use to find out significant difference between the mean of various group. The result indicated at that 0.05 level of significance the subject of different group differed significantly on the measure of upper arm length and sitting height. The other factor responsible for performance of sportsman in any disciples depends upon proficiency of skill training motivation and various other components of anthropometric such as age sex and other body measurement.

**Kaur (2010)** studies on comparison anthropometric components between forward and defender in female soccer player. The researcher has collected data on 40 soccer player (20 offensive and 20 defensive) of inter college level fr0m various college affiliated with Punjab university (CHD). The researcher selected 10 anthropometrical variable normally weight, height, sitting height, leg length, arm length, hip length, knee length, ankle height, foot height and calf circumference. The data was collected in playfield of Gurusar sudhar college campus. It was found that defensive player were superior to maximum all variables.

**Karkare and Ajay (2011)** compared the body composition and anthropometric measurement of hockey player with respect of their playing position for the purpose of the study two hundred and ten junior nation hockey player seventy each from half line back line and foreword line was selected different state from India. Anthropometric measurement including Height, weight, diameter, breaths, girth, and skin fold thickness was taken from entire subject body composition was measure with the help of Matiegka's method (1921). To find the significant difference statically method one-way ANOVA was used. Result found that hockey player playing find the different in anthropometric measurement and body composition.

**S author JJ1, McGuine TA, Leverson G**, Best TM. Study the measuring and performance measures for top faculty basketball players to see doable measuring and performance sex variations during a population of highschool basketball players Measurements were collected throughout the primary week of basketball observe before the session Varsity basketball players from four high faculties were tested on A battery of measures chosen to notice doable measuring and performance sex variations. liv feminine and cardinal male subjects, from varsity basketball groups at high faculties

registered within the grooming stretch program at the University of Wisconsin Hospital medicine Center in Madison, WI, volunteered to require half during this study. MEASUREMENTS: we have a tendency to took measuring measurements on every of the a hundred and fifteen subjects. These enclosed height, weight, body composition, mortise joint vary of motion, and medial longitudinal arch sort in weight bearing. Performance measures enclosed the vertical jump, 22.86-m (25-yd) shuttle run, 18.29-m (20-yd) sprint, and single-limb balance time.

We compared measuring and performance characteristics employing a 2-sample t check. The sole exception to the present was for medial longitudinal arch sort, wherever the two teams were compared employing a 2-tailed Fisher's precise check. The male subjects were considerably taller and heavier, whereas the females had a considerably higher share of body fat. There have been no important variations found for mortise joint region flexion and flexure, however the females had considerably additional inversion and eversion vary of motion. Analysis of medial longitudinal arch sort found females to own a better share of pronated arches and males to own a better share of supinated arches. Performance testing discovered that the males were able to jump considerably higher and run the twenty two.86-m (25-yard) shuttle run and eighteen.29-m (20-yard) sprint considerably quicker than the feminine subjects. There was no important distinction between the teams for single-limb balance time.

**David Zalai** This study examined practical movement patterns, anthropometric characteristics and motor skills in elite young football game player's mistreatment the well-established purposeful Movement Screens system (FMS™). Sixty elite male football game players participated (age sixteen.7 ± 2.3 y, height 185.4 ± 5.7 cm, weight 82.8 ± 6.7 kg, BMI 24.1 ± 1.3 kg/m2) from four age-based groups. There have been seven Goalkeepers (GK), seventeen Defenders (DEF), twenty seven Midfielders (MID) and nine Forwards (FW). We tend to measured five m, 10 m, and thirty m sprint times and participants' vertical jump height and long jump distance. The FMS™ was wont to measure practical movement ability. Our study indicated that five of the seven measured variables were vital once considering position assignment of advanced youth football game players. These area unit the 5 m sprint, 30 m sprint, BMI, vertical jump, and FMS™ score. Purposeful movement ability could also be helpful within the physical development of football game skills and performance. A FMS™ score of ≤

fourteen was found in twenty eighth of players and spatiality was noted in forty first, each thought-about a vital risk issue of injury.

# CHAPTER-III

# METHOD AND PROCEDURE

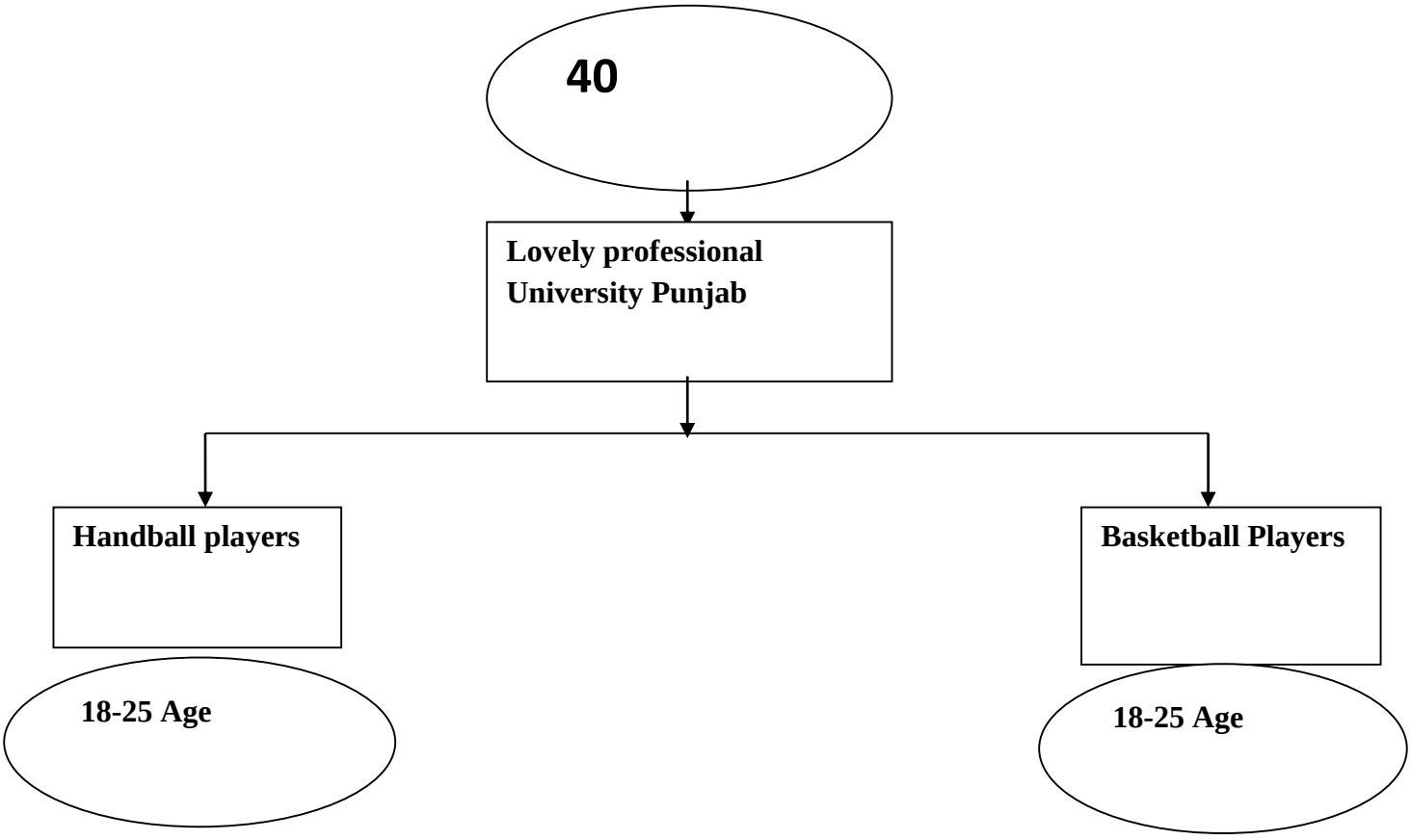
# CHAPTER III

# METHOD AND PROCEDURE

After the selection of the problem of hypothesis, there is a need to give a practical shape to the research, proper planning and preparation of appropriate research design because research design is a blue print of what is to be done and how to be done. It is the path followed by the researcher to the target. In simple language a research design started is a plan of action a plan of collecting and analyzes data in an efficient and relevant manner. The ultimate research project greatly depends upon the design of the study. It includes sampling, research strategy tools and techniques and procedure employed to gather data. In the present research following research design was adopted.

## SAMPLING AND RESEARCH DESIGN

For the present study the investigator adopted descriptive research design on 40 university level handball and basketball players selected through purposive sampling technique aged between 18-25 years in Lovely Professional University.



## TOOLS

In consolation with expert and considering testers competency and even feasibility criteria in mind especially of equipment reliability and time factor, the following anthropometric tools was selected for the study, namely: the following tool were used for collection of data.

1. Anthropometric rod was used to measure height of Handball and Basketball players.
2. Weighting machine was used to measure the weight of Handball and Basketball players.
3. Skin fold caliper was used to measure fat percentage of handball and basketball players.

## TEST ITEMS

The following standardize anthropometric measurement were considered by Wiener and Lourie (1969) method for data collection

1. Standing height
2. Body weight
3. Calf skinfold
4. Thigh skinfold
5. Triceps skinfold
6. Biceps skinfold
7. Sub scapular skinfold
8. Suprailiac skin fold

## PROCEDURE

## STANDING HEIGHT

Equipment: Anthropometric Rod

Purpose: to measure the vertical distance from vertex (v) to floor. Vertex (v) is the height point on the head when the subject stand in erect posture and the head is on eye ear plane.

Procedure: The subject was asked to stand erect on a horizontal surface stretching the body as must as possible. Heels of the subject must be touching each other and the head must be on eye ear plane. The anthropometry rod was placed on the mid saggittal plane of the subject. The moving crossbar of the anthropometric rod was allowed to touch the vertex of the subject lightly. Result was recorder from the reading scale of the vertically placed anthropometric rod in centimeter.

## BODY WEIGHT

Equipment: Weighting Machine

Purpose: To measure the total body weight of the subject.

Procedure: Body weight was the weight of the body when the stomach was empty. The subject was call to stand erect on the weighting machine with their foot and minimum clothes. Result were recording from the reading scale of the weighting machine in kilogram.

## SKIN FOLD MEASUREMENT

Equipment's: Skin Fold Caliper

Purpose: To measure the intersection of a line joining the spinal (front part of iliac crest) and the interior (front) part of axilla (armpit) and a horizontal line at the level of the iliac crest.

Procedure: A Skin fold was lifted about 1 centimeter above and two centimeter medial to the interior superior iliac of the left side. The jaws of the skin fold caliper were applied parallel to the natural direction of picked up which was usually ho horizontal or slightly oblique pointing upward latterly and downwards medially. The reading was recorder in millimeter.

## CALF SKIN FOLD

Equipment's: Skin Fold Caliper

Purpose: To measure the calf skin folds of the subjects.

Procedure: A vertical skin fold was lifted on the medial side of the lower leg of at the maximum girth of the calf with the subject seated on the chair with knee bent in 90 degree.

## THIGH SKIN FOLD

Equipment's: Skin Fold Caliper

Purpose: To measure thigh skin fold of subject

Procedure: The subject was asked to sit on the chair. The legs was straight and relax. The skin fold was lifted on the anterior aspect of the thigh from level were circumference of the thigh was taken with the Harpendan caliper.

## TRICEPES SKIN FOLD

Equipment's: Skin fold Caliper

Purpose: To measure the thickness of the double layer skin and subcutaneous fat on the posterior side of the upper arm over the triceps muscle in the middle of upper arm.

Procedure: The subject was asked to stand erect hanging the arms freely by the side. Mark the midpoint of the upper arm of the subject over the triceps muscle. Picking up the skin fold about 1cm above the marked point the jaws of the skin fold caliper will applied. The result were recorder after two second applying pressure from the circular reading scale of the skin fold caliper in millimeter.

## BICEPES SKIN FOLD

Equipment's: Skin Fold Caliper

Purpose: To measure the thickness of double layer skin and subcutaneous fat on the posterior side of upper arm over the biceps muscle in the middle of upper arm.

Procedure: This skin fold was taken on the front of the arm at the level marked on the skin for the arm circumference directly line with the center of the cubical fosses. Precaution must be taken to pick up all the subcutaneous adipose tissue. The measurement in noted two second after applying the full pressure.

## SUB SCAPULAR SKIN FOLD

Purpose: To measure the thickness of double layer of skin and subcutaneous fat below the inferior angle of left scapula.

Procedure: the skin fold was picked diagonally below the inferior angle of scapula of the almost parallel to the medial border of scapula with is lower end pointing outwards. The jaws of caliper were applied about half a centimeter.

## SUPRAIALIAC

Below the fold picking tip of the thumb the measurement as usual was recorder after 2 second of releasing full pressure on the fold in millimeter.

Equipment's: Skin Fold

Purpose: to measure the intersection of a line joining the spinel (front part of lilac crest) and the anterior (front) part of the axilla (armpit) and the horizontal line at the level of lilac crest.

Procedure: a skin fold was lifted about one centimeter above and two centimeter medial to the anterior superior iliac on the left side. The jaws of the skin fold caliper were as applied parallel to the natural direction of pick up skin fold which was usefully horizontal or slightly oblique pointing upward latterly and down ward medially. The reading was recorder in millimeter.

## STATISTICAL PROCEDURE

The statistical technique of't' test was used by the investigator to analysis the different anthropometric dimension of handball and basketball players.

# CHAPTER-IV

# RESULT

# AND

# DISCUSSION

# CHAPTER-IV

# RESULT AND DISCUSSION

## Result, Discussion, Interpretation and Recommendation

The main aim of the investigation is to find out the result of the study, which can be done with help of orgies. The main aim and objective are achieved and tested hypotheses were formulated. The data was collected from more than more source.

3.0 Result Pertaining to comparative difference of between Handball and Basketball players.

## Table 4.1

## Comparison of Height between Handball and Basketball players

| Group | N | mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball players | 38 | 174.15 | 5.86 | 38 | 0.194 |
| Basketball players | 38 | 176.5 | 6.24 | | |

Significance at 0.05 level

T-value required to be significant at 38 df = 1.68

Table 3.1 show the compression of height between handball and basketball player. The mean value of height are found 174.15 and 176.5cm respectively, whereas standard deviation are calculated 5.86 and 6.25 on both mean the t value is found 0.19 which show significant difference.

## Figure 4.1

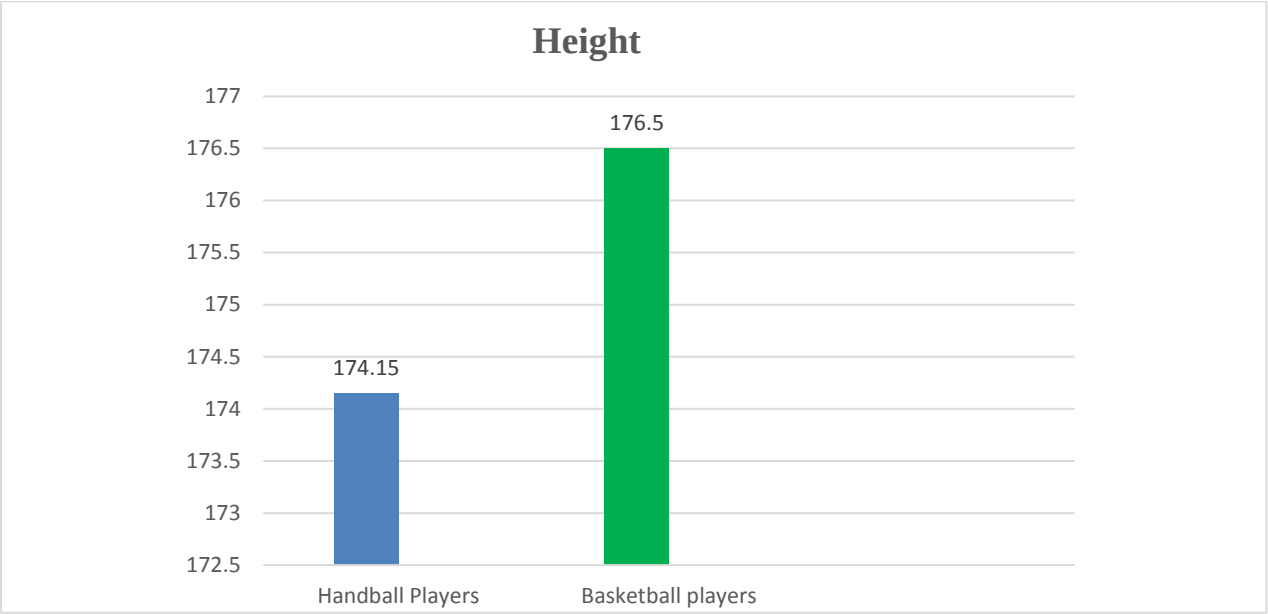



Figure 3.1 show the compression of height between handball and basketball players.

## Table 4.2

## Comparison of Weight between Handball and Basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball players | 38 | 66.1 | 8.21 | 38 | -13.71 |
| Basketball player | 38 | 64.9 | 8.13 | | |

t-value required to be in significant at 38 df = 1.68

Table 3.2 show the compression of weight between handball and basketball player the mean value of weight are found 66.1 and 64.9 respectively whereas standard deviation are calculated 8.21 and 8.13 on both mean the t-value is found -13.71 which show

statistically result were insignificant at .05 level of confidence. Thus the hypothesis two is rejected.

## Figure 4.2

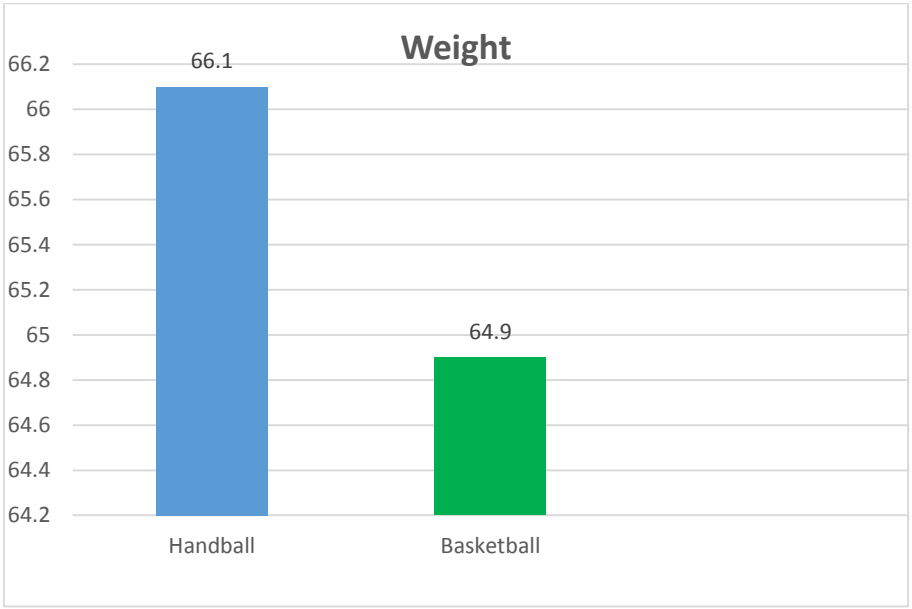



Figure 3.2 show the compression of weight between handball and basketball player.

## Table 4.3

## Comparison of biceps fat percentage between Handball and Basketball

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball players | 38 | 4.85 | 1.09 | 38 | -0.64 |
| Basketball Players | 38 | 5.06 | 1.22 | | |

t-value required to be insignificant at 38 df = 1.68

Table 3.3 show the comparison of biceps fat percentage between handball and basketball players. The mean value of biceps fat percentage are found 4.85 and 5.06 respectively. Whereas standard deviation calculated 1.09 and 1.22 on both mean the t-value is found –0.64 which show insufficient at 0.05 level of confidence thus the hypotheses three is rejected.

**Figure 4.3**

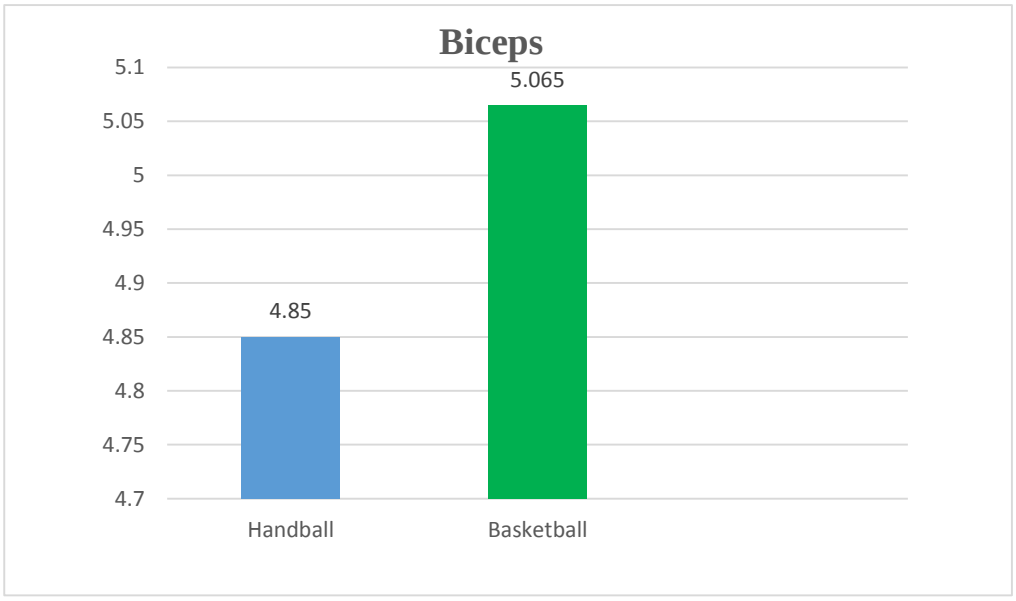



Figure 3.3 show the compression of biceps fat percentage between handball and basketball players.

## Table 4.4

## Comparison of Triceps fat percentage between Handball and Basketball players

| Group | N | Mean | SD | DF | T-Value |
|---|---|---|---|---|---|
| Handball Players | 38 | 9.37 | 2.56 | 38 | 2.84 |
| Basketball players | 38 | 8.73 | 3.07 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.4 show the comparison of biceps fat percentage between handball and basketball players. The mean value of Triceps fat percentage are found 9.37 and 8.73 respectively. Whereas standard deviation calculated 2.56 and 3.07 on both mean the t-value is found 2.84 which show insufficient at 0.05 level of confidence thus the hypotheses four is rejected.

## Figure 4.4

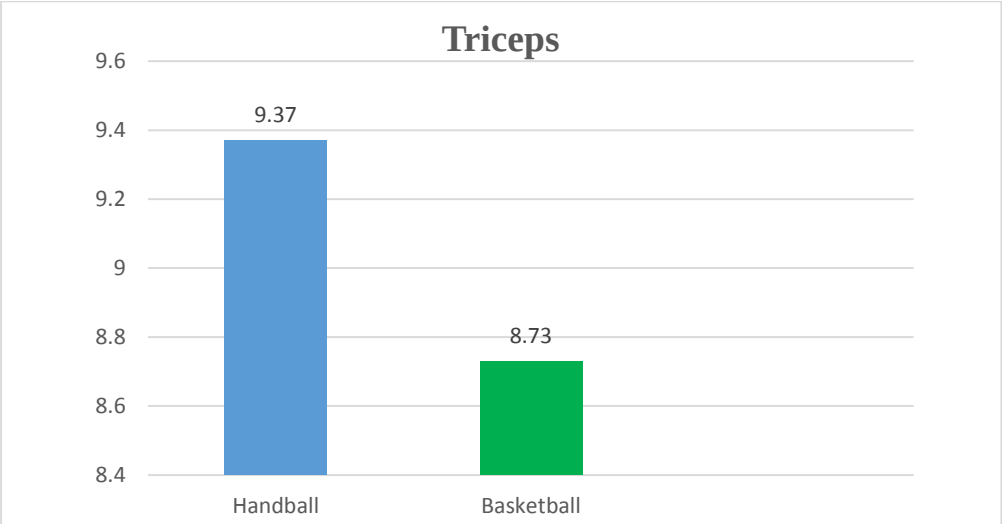



Figure 3.4 shows the compression of triceps fat percentage between handball and basketball players.

## Figure 4.5

## Comparison of mean thigh fat percentage between handball and basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball payers | 38 | 10.91 | 2.88 | 38 | 3.29 |
| Basketball players | 38 | 11.11 | 3.37 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.5 show the comparison of thigh fat percentage between handball and basketball players. The mean value of thigh fat percentage are found 10.91and 11.11 respectively. Whereas standard deviation calculated 2.88 and 3.37 on both mean the t-value is found

3.29 which show insufficient at 0.05 level of confidence thus the hypotheses five is rejected.

## Figure 4.5

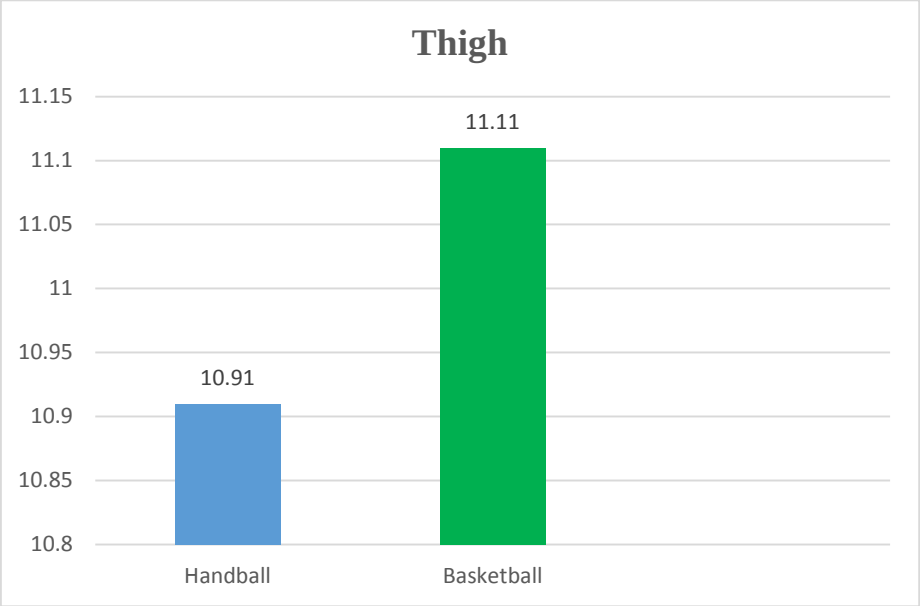



Figure 3.5 shows the compression of Thigh fat percentage between handball and basketball players.

## Table 4.6

## Comparison of mean calf fat percentage between handball and basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball players | 38 | 9.84 | 3.01 | 38 | 4.28 |
| Basketball players | 38 | 8.83 | 2.05 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.5 show the comparison ofcalf fat percentage between handball and basketball players. The mean value of calf fat percentage are found 9.84 and 8.83 respectively. Whereas standard deviation calculated 3.01 and 2.05 on both mean the t-value is found 4.28 which show insufficient at 0.05 level of confidence thus the hypotheses six is rejected.

## Figure 4.6

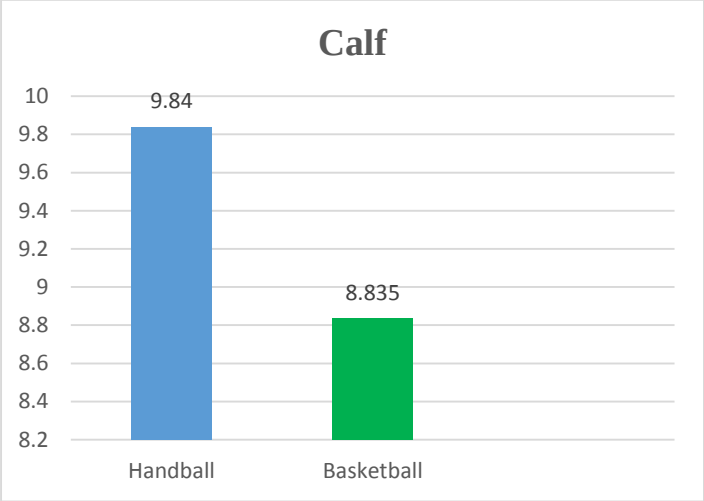



Figure 3.6 shows the compression of calf fat percentage between handball and basketball playe

## Table 4.7

**Comparison of mean subscapular fat percentage between handball and basketball players.**

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball Players | 38 | 10.27 | 2.79 | 38 | 3.01 |
| Basketball Players | 38 | 9.75 | 3.16 | 38 | |

t-value required be insignificant at 38 df = 1.68

Table 3.7 show the comparison of subscapular fat percentage between handball and basketball players. The mean value of subscapular fat percentage are found 10.27and 9.75 respectively. Whereas standard deviation calculated 2.79 and 3.16 on both mean the t-value is found 3.07 which show insufficient at 0.05 level of confidence thus the hypotheses seven is rejected.

## Figure 4.7

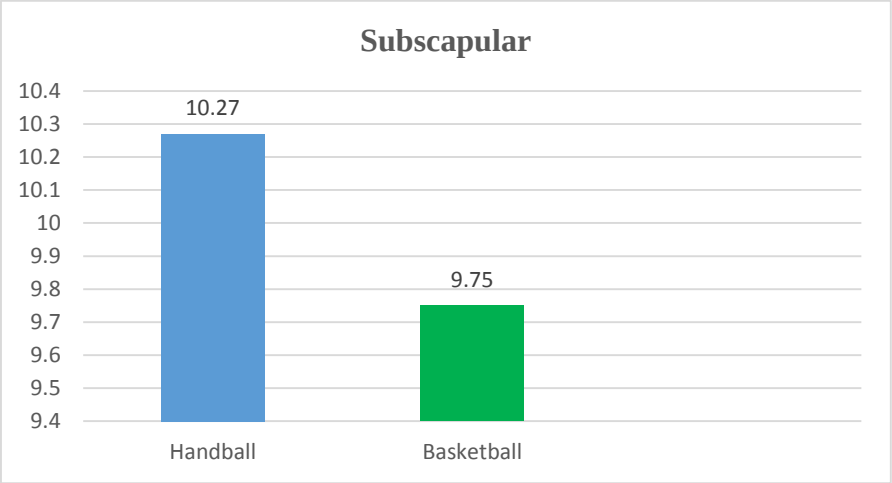



Figure 3.7 shows the compression of subscapular fat percentage between handball and basketball players.

## Table 4.8

## Comparison of mean suparalic fat percentage between handball and basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball players | 38 | 8.44 | 2.31 | 38 | 3.03 |
| Basketball players | 38 | 8.19 | 2.70 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.7 show the comparison of suprailac fat percentage between handball and basketball players. The mean value of suprailac fat percentage are found 8.44 and 8.19 respectively. Whereas standard deviation calculated 2.31 and 2.70 on both mean the t-value is found 3.03 which show insufficient at 0.05 level of confidence thus the hypotheses eight is rejected.

**Figure 4.8**

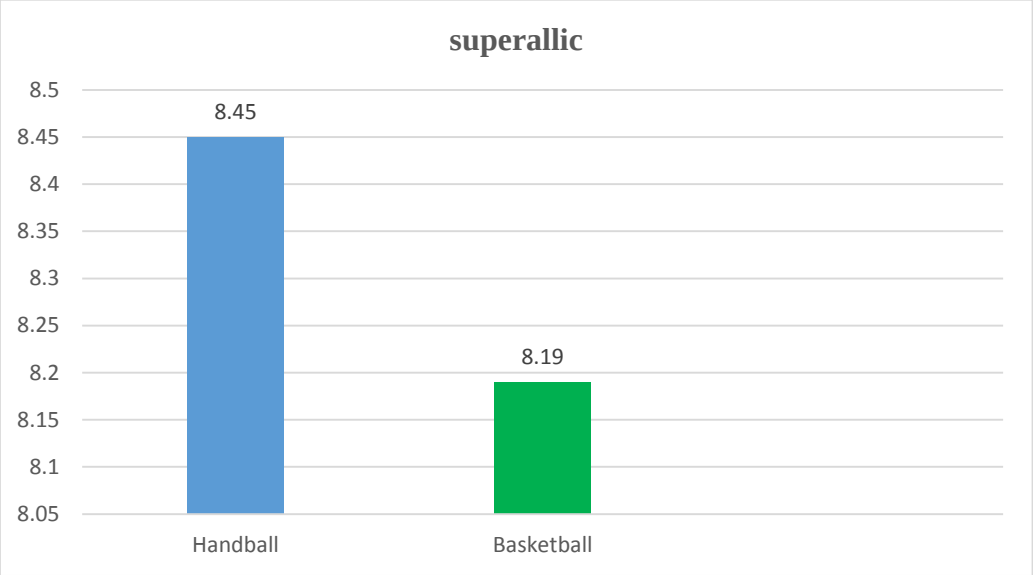



Figure 3.8 shows the compression of superallic fat percentage between handball and basketball players

## Table 4.9

## Comparison of mean bmi fat percentage between handball and basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball players | 38 | 21.78 | 2.49 | 38 | 10.98 |
| Basketball players | 38 | 20.79 | 1.89 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.7 show the comparison of bmi fat percentage between handball and basketball players. The mean value of bmi fat percentage are found 21.78 and 20.79 respectively. Whereas standard deviation calculated 2.49 and 1.89 on both mean the t-value is found 10.98 which show insufficient at 0.05 level of confidence thus the hypotheses nine is rejected.

## Figure 4.9

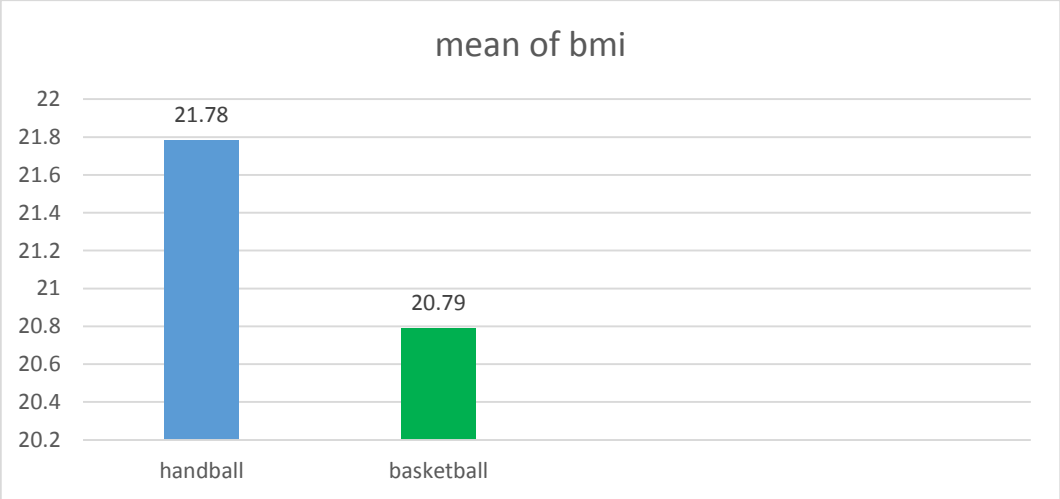



Figure 3.8 shows the compression of bmi fat percentage between handball and basketball players.

## Table 4.10

## Comparison of mean body fat percentage between handball and basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball player | 38 | 13.65 | 2.65 | 38 | 4.47 |
| Basketball players | 38 | 13.05 | 2.91 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.9 show the comparison of body fat percentage between handball and basketball players. The mean value of body fat percentage are found 13.56 and 13.05 respectively. Whereas standard deviation calculated 2.65 and 2.91 on both mean the t-value is found 4.47 which show insufficient at 0.05 level of confidence thus the hypotheses ten is rejected.

## Figure 4.10

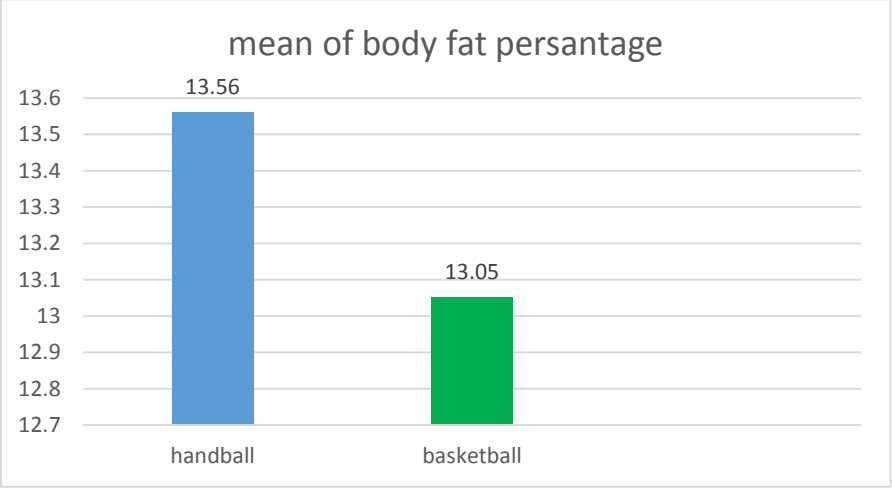


Figure 3.9 shows the compression of body fat percentage between handball and basketball players

## Table 4.11

## Comparison of lean body mass between handball and basketball players

| Group | N | Mean | SD | DF | T-value |
|---|---|---|---|---|---|
| Handball player | 38 | 86.43 | 2.65 | 38 | 29.81 |
| Basketball player | 38 | 86.95 | 2.91 | | |

t-value required be insignificant at 38 df = 1.68

Table 3.9 show the comparison of lean body mass between handball and basketball players. The mean value of lean body mass are found 86.43 and 86.95 respectively. Whereas standard deviation calculated 2.65 and 2.91 on both mean the t-value is found 29.81 which show insufficient at 0.05 level of confidence thus the hypotheses eleven is rejected.

## Figure 3.9

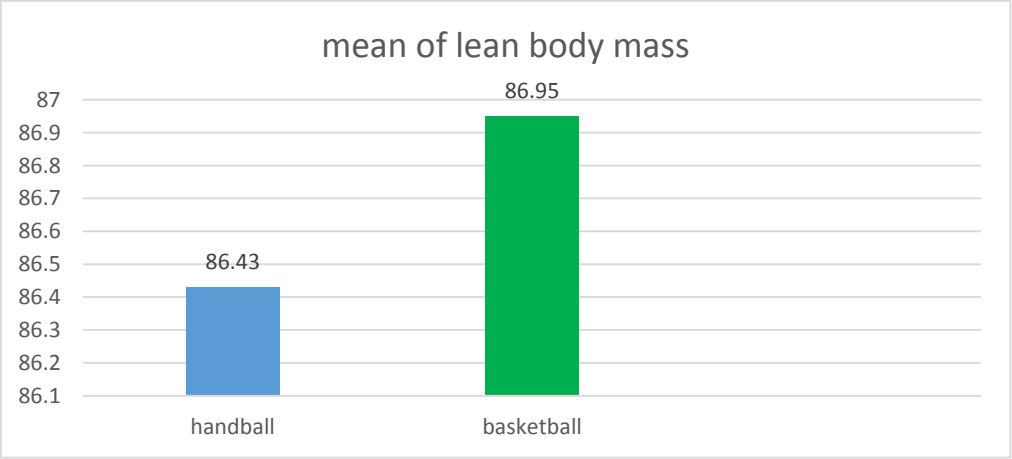


Figure 3.9 shows the compression lean body mass percentage between handball and basketball players.

## Testing of hypotheses

The proposed hypotheses that there would be significant difference between Handball and Basketball player related to their height weight fat percentage and bone mass. The finding of the present study indicate significant difference between handball and basketball player as related to height and lean body mass. So hypotheses number one and four were accepted in all cases the purposed no two and three hypotheses are having insignificant difference between handball and basketball players so the hypotheses two and three are rejected.

# CHAPTER-V

# SUMMERY

# AND

# CONCLUSION

## CHAPTER-V

### SUMMRY

The present study show the anthropometric measurement of handball and Basketball players. Handball player are found smaller and heavier as compare to Basketball player.

In the case of body fat percentage handball players have possessed greater fat percentage as compare to Basketball players. Basketball player have great body mass have compare to Handball players.

### Interpretation

The present study show the Handball player are smaller and heavier compared to Basketball players. Handball player fat percentage are greater compare to Basketball players. Basketball players body mass are greater compare to Handball players.

## Conclusion

Significant difference was observed between Handball and Basketball players on the Variable Height. Handball players are found smaller comparison to Basketball players.

Insignificant difference was observed between handball and basketball player on the variable height.

Insignificant difference was found on the variable Handball and Basketball player's fat percentage.

Significant difference found on the variable handball and basketball players body mass basketball body mass are greater compare to handball player.

## Recommendation

Based on the conclusion drawn in the present study following recommendation have been made:

1. The similar studies can also be conducted on female Handball and Basketball player in university level.
2. Similar studies may be conducted by using sophisticated equipment's and subject of higher level sports participation.
3. Similar study may be undertaken to analyze other different games.

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# Appendix

## Raw Data of Handball Player

| Name | Height | Weight | B.s.f | B.s.f | T.h.s.f | C.s.f | S.s.s.f | S.l.s.f | BMI | B.f.p | L.b.m |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lakhwinder Singh | 172 | 75 | 4.2 | 13 | 17 | 11 | 7 | 5.5 | 25.4 | 12.6 | 87 |
| Navjot Singh | 183 | 68 | 3.2 | 6.9 | 10.4 | 7.4 | 7.1 | 6.2 | 20.3 | 9.8 | 90 |
| Amninder Singh | 176 | 84 | 3.4 | 11 | 12 | 6 | 15 | 11 | 27.1 | 16.3 | 83 |
| Rohan | 166 | 66 | 5.3 | 10.3 | 9.6 | 9.1 | 10.4 | 9.1 | 24 | 14.6 | 85 |
| Pankaj | 178 | 70 | 5.3 | 8.2 | 12 | 17 | 10 | 8.2 | 22.1 | 13.4 | 86 |
| Naval | 173 | 71 | 4.2 | 7 | 6.4 | 8.2 | 9.1 | 7.1 | 23.7 | 11.7 | 88 |
| Pawandeep | 163 | 50 | 4.4 | 8 | 9.2 | 8.3 | 9.5 | 7.3 | 18.8 | 12.4 | 87 |
| Amrinder Singh | 178 | 67 | 5.2 | 7.3 | 7.5 | 6.2 | 8.5 | 6.8 | 21.1 | 11.8 | 88 |
| Rajat | 178 | 63 | 5.4 | 12 | 12 | 13 | 14 | 12.2 | 19.9 | 17.2 | 82 |
| Shabhijot | 176 | 66 | 6.3 | 6.4 | 11 | 7.2 | 7.5 | 6.1 | 21.3 | 11.2 | 88 |
| Paramjot singh | 177 | 50 | 5.2 | 12 | 10.2 | 8.2 | 7.5 | 6.2 | 16 | 13.1 | 86 |
| Onkarpreet | 162 | 58 | 3.2 | 9.6 | 14 | 11 | 8 | 6.3 | 22.1 | 11.5 | 88 |
| Aayush | 174 | 63 | 7.3 | 12 | 13 | 17 | 12 | 9.8 | 20.8 | 16.5 | 83 |
| Abhinay | 175 | 68 | 5.2 | 8.3 | 8.4 | 9.2 | 9.5 | 8 | 22.2 | 13.1 | 86 |
| Gurpreet Singh | 179 | 68 | 4.5 | 8.4 | 6.5 | 8.3 | 11 | 9.1 | 21.2 | 13.9 | 86 |
| Ajmal | 171 | 70 | 3.5 | 5 | 8 | 9.1 | 7 | 6.2 | 23.9 | 8.9 | 91 |
| Varinder | 176 | 62 | 4.2 | 6 | 10 | 9.5 | 9.3 | 7.8 | 20 | 11.3 | 88 |
| Rajneesh | 167 | 57 | 5.5 | 10 | 12 | 10 | 15 | 12.2 | 20.4 | 17 | 8 |
| Yogesh | 176 | 76 | 6.2 | 13 | 13 | 12 | 14 | 11.8 | 24.5 | 17.6 | 82 |
| Rohit | 183 | 70 | 5.3 | 13 | 16 | 9.1 | 14 | 12 | 20.9 | 17.4 | 82 |

# Raw Data of Basketball Players

| Name | Height | Weight | B.s.f | T.s.f | T.s.f | C.s.f | S.s.s.f | S.P.S.F | bmi | B.F.P | L.B.M |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ravinder | 172 | 65 | 4.5 | 8 | 9.5 | 8 | 9.2 | 8.1 | 22 | 12.6 | 87.4 |
| Kriti | 178 | 66 | 7.2 | 6.4 | 11 | 7.2 | 7.4 | 6.3 | 20.8 | 11.6 | 88.4 |
| Sachin | 177 | 55 | 7.5 | 15 | 17 | 10 | 12 | 10.3 | 17.6 | 17.5 | 82.5 |
| Harpal | 175 | 68 | 3.5 | 5.2 | 8 | 9 | 7 | 5.4 | 22.2 | 8.6 | 91.4 |
| Arvind | 176 | 62 | 4.5 | 7.3 | 6.1 | 8 | 9 | 8.2 | 20 | 12.3 | 87.7 |
| kiran | 163 | 50 | 5.5 | 13 | 16 | 9.1 | 13 | 11.5 | 18.8 | 17 | 83 |
| Lalit | 166 | 66 | 5.6 | 7.3 | 7.2 | 6.2 | 9.2 | 7.3 | 24 | 12.5 | 87.5 |
| Shivam | 178 | 63 | 6 | 8.5 | 9.2 | 9.5 | 9.5 | 8.5 | 19.9 | 13.6 | 86.4 |
| Aman | 179 | 70 | 4.5 | 15 | 18 | 12 | 18 | 15 | 21.8 | 19.5 | 80.5 |
| Harsh | 183 | 75 | 3.5 | 9.5 | 14 | 12 | 8 | 7 | 22.4 | 11.9 | 88.1 |
| Jaswant | 174 | 65 | 4 | 7.5 | 14 | 8.1 | 17 | 14 | 21.5 | 16.9 | 83.1 |
| Eienstin | 189 | 75 | 4.5 | 11 | 12 | 14 | 9.5 | 6.5 | 21 | 13.3 | 86.7 |
| Gautam | 178 | 72 | 4.2 | 5.5 | 8 | 9.1 | 7 | 6 | 22.7 | 9.4 | 90.6 |
| Richu | 176 | 62 | 5.2 | 7.4 | 7.2 | 6.1 | 7.5 | 5.5 | 20 | 10.9 | 89.1 |
| Ashish | 180 | 65 | 6.5 | 6.2 | 11 | 7.5 | 8 | 6 | 20.1 | 11.3 | 88.7 |
| Tajinder | 177 | 60 | 3.5 | 6 | 8 | 9.5 | 7 | 6 | 19.2 | 9.3 | 90.7 |
| Paramjeet | 167 | 55 | 4.1 | 12 | 11 | 6.5 | 12 | 10 | 19.7 | 15.6 | 84.4 |
| Mukul | 182 | 64 | 6 | 6.5 | 12 | 7.4 | 7.4 | 7.3 | 19.3 | 11.6 | 88.4 |
| Harsimran | 185 | 85 | 6.5 | 6.3 | 11 | 7.5 | 8 | 7.5 | 24.8 | 12 | 88 |
| Simranjeet | 175 | 55 | 4.5 | 11 | 12 | 10 | 9.3 | 7.5 | 18 | 13.6 | 86.4 |