Anthropometric and Physiological Profiles of University Volleyball and Basketball Players: A Comparative Analysis

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Abstract

Introduction: Volleyball and basketball are two popular sports that require unique combinations of technical, tactical, and physical attributes. Understanding the anthropometric and physiological characteristics of university-level players can inform training programs and talent identification.
Objectives: This study aimed to compare the anthropometric and physiological profiles of male university volleyball and basketball players, and to identify significant differences between the two groups.
Methodology: A cross-sectional design was employed, incorporating a battery of anthropometric (body composition, limb lengths, and circumferences) and physiological (cardiorespiratory and hematological) measurements.
Tools: Anthropometric measurements were taken using a stadiometer, skinfold calipers, and a tape measure. Physiological measurements were obtained using a heart rate monitor, spirometer, and blood pressure cuff.
Hypothesis: It was hypothesized that significant differences would exist between the anthropometric and physiological profiles of volleyball and basketball players.
Results: The study's findings highlight the importance of sport-specific anthropometric characteristics in university-level volleyball and basketball players.
Findings: Results showed significant differences in anthropometric variables, with basketball players exhibiting greater values for weight, height, limb lengths, and circumferences ($p < 0.05$). No significant differences were found in physiological variables.
Managerial Implications: Coaches and trainers can use these findings to inform talent identification and develop targeted training programs.
Recommendations: Future studies should investigate the longitudinal development of anthropometric and physiological characteristics in volleyball and basketball players. This study provides novel insights into the anthropometric and physiological profiles of university-level male volleyball and basketball players, highlighting the importance of sport-specific characteristics in achieving success.

Keywords: anthropometric, physiological, volleyball, basketball, university-level athletes, sport-specific characteristics.

1. INTRODUCTION

By nature, human beings are competitive and ambitious for the excellence in all athletes' performance. Not only every man but also every nation wants to show their supremacy by challenging the other man or nations. This challenge stimulates, inspires and motivates the entire nation to sweat and strive to run faster, jump higher, throw faster and exhibit greater speed, strength, endurance and skills in the present competitive sports world. This can only be possible through scientific, systematic and planned sports training, as well as, channelizing

them into appropriate games and sports by landing out their potentialities. Sports by their nature are enjoyable, challenging and absorbing, and require a certain amount of skills and physical condition. In the order of human values, conquest in the field of sports holds a unique plane. It is the combination of success, victory, triumph and domination of mover other team mates and friends. The sublimity of competition is in the loser's acclaim for the winners, which along with the friends will acknowledge both defeat and triumph.

Anthropometric and Physiological parameters have been found to discriminate among successful athletes in different sports. However, work with pre-adolescent athletes has demonstrated clearly that the identification of talented performers is not possible by anthropometrical and physical measures before the adolescent growth period due to their instability. Talent detection and identification models that rely on anthropometrical and physical measures would only work if the measurement of the key variables occurred once it was known that their relative values between individuals were stable. Gender difference at the onset of peak values would also need to be acknowledged. Unfortunately, such models would be problematic to develop due to the stability of many factors e.g., posture, flexibility and speed which are accepted as being important to success in various sporting events, since they have not been studied in a systematic way. Further, the delayed identification of individuals into sports would likely be resisted due to clear correlation that has been established between the number of years of deliberate practice and success. Additionally, whilst anthropometrical and physical talent detection and identification models determinants of performance rather than potential, recent research, has questioned the ability of physiological and anthropometrical factors to distinguish among athletes in different events.

Volleyball and basketball are popular and played professionally in every nation across the world. Technical and tactical skills are important, but suitable anthropometric and physiological characteristics are also important prerequisite to become successful in these sports. Physical and physiological properties influence the performance of a player and strategy of a team because experts suggest that the ball games required repeated maximum exertion e.g. dashing and jumping which are also important for university Basketball and Volleyball men players to achieve optimum level of performance.

Volleyball is a very specialised sport, with both anthropometric and physiological characteristics being unique at the various positions. This study helps to identify the anthropometric differences between positions and illustrate that adiposity, musculoskeletal robustness, and linearity are each specific among the various positions. Basketball and volleyball are highly complex team sports due to their technical, tactical, physical, psychological, and anthropometric demands. A large number of studies describe the importance of high technical–tactical mastery and strong physical development to achieve performance in these sports disciplines. Along this line, among all the performance factors affecting indoor team sports, both physiology and anthropometry are two aspects that should be considered. Physical fitness is defined as the ability to perform daily tasks with vigor and alertness, without undue fatigue and with sufficient energy to enjoy leisure activities and to cope with unforeseen emergencies. The same authors proposed a multifactorial component sports training style aimed at working on different components and behaviours that together lead to such performance. Specifically, this performance is linked to the importance of strength as a basic physical capacity, as well as to the capacities derived or resulting from it both from the point of view of physical improvement and health and from the specific perspective of efficiency or performance. Among these performance indicators, anthropometric determinants

such as body composition, anthropometric dimensions, and athlete characteristics play a fundamental role in performance, given that anthropometry is a third physical attribute commonly associated with athletic performance. Specifically, anthropometric parameters such as Body weight, Standing Height, Arm Length, Leg Length, Thigh girth have been associated with performance in elite Volleyball and basketball men players in the study area. In that way, descriptive studies of anthropometric and body composition characteristics in most elite team sports have been conducted since the 1970s.

Basketball is an intermittent sport and has gained tremendous popularity worldwide because of its dynamic characteristics as a team sport Hoffman & Maresh, (2000). Understanding the anthropometric in every field is an important, determining and influential factor in the performance of athletes. It has been well established that an anthropometric profile indicates whether a player would be suitable for the competition at the highest level in a specific sport. In fact, the information regarding the anthropometric status of an athlete is essential for two main reasons, firstly, to design an effective training program, and, secondly to select the event-specific talents in the athletes. Some anthropometric characteristics, e.g. length and breadth measurements, are genetically determined and can hardly be changed with the effects of a training program. Various anthropometric characteristics were found to be closely associated with excellent performances. Several studies have been undertaken to ascertain specific physical, anthropometric profile of athletes in a variety of sports. For example, with respect to team sports, player profiling by position has been studied in Basketball, field hockey, basketball, netball, and soccer. It requires players to participate in frequent short bouts of high intensity exercise, followed by periods of low intensity activity. There is no definite answer to the question of whether sporting champions of these games have different characteristics at birth or whether they acquire them later through training. But successful participation in these sports requires from each player a high level of technical and tactical skills and suitable anthropometric characteristics. All ball games require comprehensive abilities including physical, technical, mental, and tactical abilities. Among them, physical abilities of the players are more important as these have marked effects on the skill of players and the tactics of the teams because ball games require repeated maximum exertion such as dashing and jumping. In Sports performance, an abundant variety of different factors influencing performance have been found. Apart from physiological parameters, numerous anthropometric parameters show an effect on Sports performances in runners and tri-athletes, such as body mass, body mass index, body fat, length of the upper leg, length of limbs, body height, circumference of the thigh, total skin fold and skin fold thickness of the lower limb.

2. BACKGROUND OF THE STUDY

Anthropometric measurements have uncovered co-connection between body structure, physical attributes and the games abilities. This information of numerical co-connection grants sports doctor to assess and to anticipate execution possibilities based on physical attributes and particular necessities of the amusement. Anthropometry is the branch of anthropology that is concerned with the measurement of human body. The definition has confined to the kind of measurements commonly used in associating physical performance with body build. Anthropometry involves the measurement of external part of the body, including body diameters, body circumferences somatotypes.

The game of Basket Ball adopts a means of recreation about a century back has progressed very fast from its original status of a recreational sport, it assumed the position of a minor competitive sport, before the mid of the century at university level and subsequently

as a fully-fledged competitive sport at international level in the beginning of the second half of the century. The various actions in Basket Ball are so fast that it is difficult to justify the performance of a player without analyzing it. It is ascertaining performance development of players in various factors like skills, physical, physiological, anthropometrical and psychological variables affecting performance. The topmost teams in the world have come up because they have worked hard to reach world level through long term systematic and scientific training. Thus to conclude there are many factors such as physical fitness, anthropometrical factors like height, age and sex, level of skill experience knowledge and understanding competitive instinct and so on that contribute to a Basket Baller's performance. Anthropometry 'means the measurement of man. Whether living or dead and consists primarily in the measurement of the dimensions of the body. Anthropometry the measurements of man provide scientific methods and observations on the living man and the skeleton. Anthropometry represents the typical and traditional tool of human biology, physical anthropology and axiology. Relationship between anthropometric measurements and physical fitness.

The game of Volleyball offers opportunities for the development of strength, endurance, speed, agility, and neuro-muscular skills and immediate action along with many precise educational outcomes. The game of volleyball requires a conditioning programme, which develops flexibility, muscular strength, power and agility all of which must be integrated to achieve the optimum skill performance from each player. Scientists and physiologists have been of the view that physical components of an athlete have a lot to do with the performance, more than the techniques and tactics of a player of a team. The research findings show that a high level of technical perfection alone has nothing to do with the success in competitive sports. Most of the game demands a greater amount of speed, strength, endurance, flexibility, co-ordination and maximum fitness of the organism. Thus to spot out the gaps and subsequently bridge them the researcher in the form of present study is making modest effort in this direction to prepare the anthropometrical and physiological characteristics of university level volleyball and basketball men players were selected from Bengaluru University.

The present study is therefore aimed at evaluating the anthropometric and physiological variables among university men players and track and field athletes from study area, and to compare the data with counterparts of other sports. Specific anthropometric and physiological characteristics are needed to be successful in certain sporting events.

3. LITERATURE REVIEW

A brief review of related literature is classified as anthropometric and Physiological based research studies are presented below.

Ganesh P Narode (2020) The author is highlighted in the field of physical education and sports are international discipline they develop their own international understanding and universal brotherhood in the present politically completing lives. Today's Sports movements are placing major role for developing world peace sport psychology is that branch of psychology which is ultimately connected with human behavior on the play field, both under practice and competitive situation, with a view to bring about qualitative improvement in performance and maintain the same even during the stresses of competition it to need of the study of human behavior in sports setting with an emphasis on the mental aspect of behavior sports have become the media of international relationship between the countries.

Mohamed Salama Younis (2020) in their study was to investigate the anthropometric and physiological characteristics of junior elite volleyball players in the study area and twenty-five national level volleyball players (mean (SD) age 17.5 (0.5) years) were assessed on a number of physiological and anthropometric variables. Somatotype was assessed using the Heath-Carter method, body composition (% body fat, % muscle mass) was assessed using surface

anthropometry, leg strength was assessed using a leg and back dynamometer, low back and hamstring flexibility was assessed using the sit and reach test, and the vertical jump was used as a measure of lower body power. Maximal oxygen uptake was predicted using the 20 m multistage fitness test. Setters were more ectomorphic ($p<0.05$) and less mesomorphic ($p<0.01$) than centres. Mean (SD) of somatotype (endomorphy, mesomorphy, ectomorphy) for setters and centres was 2.6 (0.9), 1.9 (1.1), 5.3 (1.2) and 2.2 (0.8), 3.9 (1.1), 3.6 (0.7) respectively. Hitters had significantly greater low back and hamstring flexibility than opposites. Mean (SD) for sit and reach was 19.3 (8.3) cm for opposites and 37 (10.7) cm for hitters. There were no other significant differences in physiological and anthropometric variables across playing positions (all $p>0.05$). Setters tend to be endomorphic ectomorphs, hitters and opposites tend to be balanced ectomorphs, whereas centres tend to be ectomorphic mesomorphs. These results indicate the need for sports scientists and conditioning professionals to take the body type of volleyball players into account when designing individualized position specific training programmes.

Sangeeta Singh & Vijay Prakash (2019) done their study was to compare the selected physiological variables namely; maximum oxygen consumption, vital capacity, resting heart rate and hemoglobin content among basketball, volleyball and handball players. Ten (10) male players of NCR region from Basketball, volleyball and Handball were selected as the subject for the study. Selected physiological variables such as maximum oxygen consumption, vital capacity, resting heart rate and hemoglobin content were presented to compare the players among basketball, volleyball and handball. To see the significant difference of selected physiological variables among basketball, volleyball and handball, the analysis of variance "F-ratio" was applied at 0.05 level of significance. For further analysis, "Post-hoc Test" (LSD Test) was applied. The handball players had shown significantly different level of VO2 max. (72.727) in comparison to volleyball (75.854) and basketball (77.094) players. However, the volleyball and basketball players had shown more or less same level of VO2. Further basketball players had shown better efficiency of heart as its mean value (56.3) was lowest among all the three groups in relation to resting heart rate. On the other hand, basketball, volleyball and handball players had shown more or less same vital capacity and hemoglobin content with a small range of variation.

4. STATEMENT OF THE PROBLEM

The physical structure especially the height and arm length have definite and decisive advantage in many games and sports. Similarly, segmental length of individual body parts especially height and arm length are of considerable advantage in certain games like Basket Ball and volleyball. The purpose of the study was to analysis on selected Anthropometric and Physiological Variables among University Volleyball and Basketball Men Players in the study area.

5. OBJECTIVES OF THE STUDY

For the purpose of analysis of Anthropometric and Physiological variables among Bengaluru University Volleyball and Basketball Men Players, the following objectives were:

1) To study the socio-demographic profile of Volleyball and Basketball Men Players of Bengaluru University.
2) To find out the relationship of selected anthropometric and Physiological variables among university Volleyball and Basketball Men Players in the study area.
3) To analyze the selected Anthropometric and Physiological Variables among University Volleyball and Basketball Men Players in the study area.
4) To compare the performance of University Volleyball and Basketball Men Players on

the basis of selected anthropometric and physiological variables.

6. SIGNIFICANCE OF THE STUDY

1. The findings of the study will help to compare anthropometric and Physiological variables among university Volleyball and Basketball Men Players in the study area in relation to positional play.
2. The results of the study will also help to evaluate the anthropometric and Physiological variables among university Volleyball and Basketball Men Players in the study area.
3. The study may throw light on the anthropometric and physiological characteristics of the men volleyball and basketball men players.
4. It may help to develop simple statistic in selecting both volleyball and basketball men players.
5. It may help the coaches and trainees to get an idea of the present performance level of the men players.

7. HYPOTHESIS

It was hypothesized that there might be a significant relationship between Selected Anthropometric and Physiological measurements variables on Volleyball and Basket Ball Field Goal Ability.

1. There is no significant difference between anthropometric and physiological measurements of selected Volleyball and Basketball men players in the study area.
2. There is no significant difference in linear measurements between Volleyball and basketball men players of Bengaluru University.
3. There is no significant differences in body circumferences between Volleyball and basketball men players
4. There is no significant difference in Physiological variables i.e. heart rate, vital capacity, blood pressure of Volleyball and basketball players.

8. RESEARCH DESIGN

In any research the most important step is the collection of suitable data. No study is possible without data collection. Data is the soul base for the adequate solution as the whole research is based on this data. The present study is an attempt to compare the anthropometrical and physiological variables among volleyball and Basketball men players who have participated in Bengaluru University.

9. METHODOLOGY

Sixty Volleyball and Sixty Basketball men players, who have participated in the Bengaluru University Intercollegiate Tournament for the year 2022-23, were selected as subject for this study. The investigator explained the purpose and significance of the study to all the selected Volley Ball and basketball players to ensure maximum co-operation from subjects.

10. SAMPLE

In the present study, 200 subjects (100 from Basketball + 100 from Volleyball) were selected from the Bengaluru University on the basis of random sampling

10.1 Selection of subjects

The purpose of the present study was to compare the selected, anthropometric and physiological measurements between volleyball and Basketball men players of Bangalore University teams. To achieve the purpose of the study, 200 players were selected at random

from each category of Basketball and Volleyball men players in the study area.

10.2 Selection of Variables

The Investigator reviewed the available literature pertaining to the study from books, journals, periodicals, magazines and research papers. Taking into consideration, the importance of variables and feasibility criteria the following variable were selected.

Reliability of Data: The reliability of data was ensured by using standard equipment.

Instrument Reliability: The testers used standardized instrument such as weighing machine, studio meter and unstretchable measuring tape.

11 OPERATIONAL TERMS

Intercollegiate Players: Players who are selected to represent the college team in the intercollegiate tournament.

Anthropometry: Anthropometry is the science of measuring human body and its part. It is used as an aid to the study of human evaluation and variables.

Height: Height is taken as the maximum distance from the point of vertex on the head to the ground.

Weight: Weight is a composite measure of total body size.

12. ANTHROPOMETRIC & PHYSIOLOGICAL MEASUREMENTS

Anthropometric Measurements

1. Body weight
2. Standing Height
3. Arm Length
4. Leg Length
5. Thigh girth

Physiological Measurements

The researcher in the present study has endeavored to test this institution to compare the difference between the various physiological and anthropometric measures of the basketball and volleyball men players.

1. Heart Rate
2. Breathing rate
3. Blood Pressure
4. Body Temperature
5. Vital Capacity

13. COLLECTION OF DATA

At the beginning, the investigator gathered all the subjects of volleyball and Basketball men players and explained the purpose of the present study to them. Necessary instruction was passed on to the subject before the administration of each test. Confidentiality of response was guaranteed. The required data in different components were collected during the course of three days in the Volleyball and Basketball field. The coaches and subjects were consulted personality and their sincere co-operation was solicited. Respondents were called to a common place when they were not busy and had enough time to spare for testing.

14. PROCEDURE FOR DATA COLLECTION

The researcher will be meeting the respondents from the field. These respondents were to be tested in them inter Bengaluru University. The researcher will make them aware of the purpose of this research work. He will be prepared mentally to give their responses to different

test items. The respondents were asked to satisfy their queries and doubts. The research investigator administered these tests with the help of other research Scholars, classmates, coach and other friends. Their assistance was taken in order to get the data of different Tests in a prerequisite manner.

15. RELIABILITY OF MEASUREMENTS:

The researcher was provided ample amount of practices to become aware of the various techniques helpful in testing different variables under the guidance of a supervisor. Various physiological variables like circumference, skinfold, blood pressure, pulse rate, and vital capacity were measured by the investigator. Their data was recorded. After the interval of 2 days, these variables were tested on the same respondents in similar situation. Data was recorded. Pearson product moment method was employed in order to get the reliable outcomes.

16. STATISTICAL DESIGN:

The data has to be presented analyzed and interpreted by a suitable statistical technique for a comprehensive understanding of the inherent lack. In the present study the Research Investigator asked to compare the selected anthropometric, physiological variables between Volleyball and Basketball men players 't' test was used by using Statistical Package for Social Sciences (SPSS).

17. ANALYSIS OF DATA ANALYSIS & DISCUSSIONS

TABLE NO: 1 Comparison of Mean Values Between Volleyball and Basketball Players Regarding Weight

Players	N	Mean	Std. Dev.	D.F.	S.E.D.	't'-Ratio
Volleyball players	100	58.22	5.84	198	0.891	2.026*
Basketball players	100	60.03	6.72			

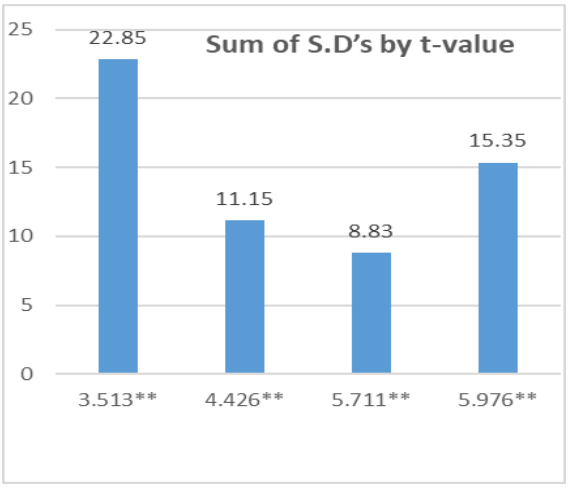
The a b o v e Table represent the significance of mean difference of Volleyball and Basketball players regarding their weight. The mean values of Volleyball and Basketball players regarding weight were 58.22 and 60.03 respectively. The calculated 't' value is 2.026 which is significant at 0.05 level of significance as the tabulated value of 't' is 1.96 at 0.05 level and 2.58 at 0.01 level of significance. So there is a significant difference in weight of Volleyball and Basketball players. The weight of Basketball players is higher than Volleyball.

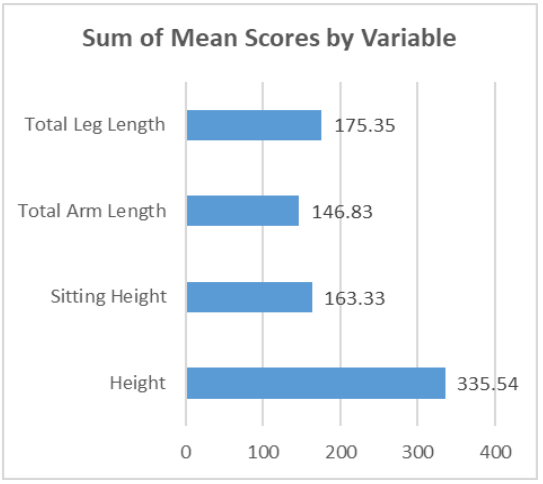
Table No: 2
Comparison of Mean Values Between Volleyball and Basketball Players Regarding Height, Total Leg Length, Total Arm Length and Sitting Height

S. No.	Variable	Group	N	Mean Scores	S.D's	t-value
1.	Height	Volleyball	100	164.38	9.98	5.976**
		Basketball players	100	171.16	5.37	
2.	Total Leg Length	Volleyball	100	85.88	4.88	5.711**
		Basketball players	100	89.47	3.95	
3.	Total Arm Length	Volleyball	100	70.47	14.55	3.513**
		Basketball players	100	76.36	8.30	

4.	Sitting Height	Volleyball	100	79.92	5.77	4.426**
		Basketball players	100	83.41	5.38	

**Significant at 0.01 level of significance





Graph: 1 Mean Values Between Volleyball and Basketball Players

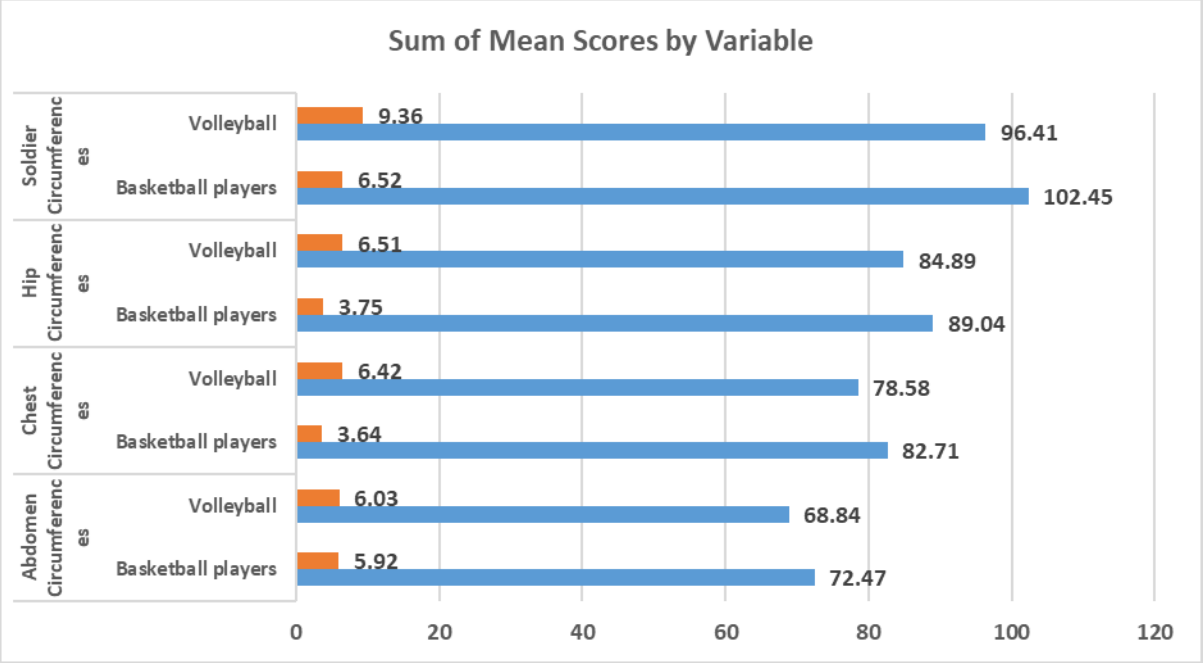
The above table represents the significance of mean difference of Volleyball and Basketball players regarding their height, total leg length, total arm length and sitting height. The mean values of Volleyball and Basketball players regarding height were 164.38 and 171.16 respectively. The calculated 't' value is 5.976 which is significant at 0.01 level of significance. So there is a significant difference in height of Volleyball and Basketball players. The higher mean score shows that the height of Basketball players is much higher as compared to height of Volleyball.

The mean values of Volleyball and Basketball players regarding sitting height were 79.92 and 83.41 respectively. The calculated 't' value is 4.426 which is significant at 0.01 level of significance. So there is a significant difference in sitting height of University Volleyball and Basketball men players. The higher mean score shows that the sitting height of Basketball players is higher as compared with the height of Volleyball.

Table No: 3 Comparison of Mean Values Between University Volleyball and Basketball Men Players Regarding Soldiers Circumferences, Chest Circumferences, Abdomen Circumferences and Hip Circumferences

Sr. No.	Variable	Group	N	Mean Scores	S.D's	t-value
1.	Soldier Circumferences	Volleyball	100	96.41	9.36	5.292**
		Basketball players	100	102.45	6.52	
2.	Chest Circumferences	Volleyball	100	78.58	6.42	5.581**
		Basketball players	100	82.71	3.64	
3.	Abdomen Circumferences	Volleyball	100	68.84	6.03	4.295**
		Basketball players	100	72.47	5.92	
4.	Hip Circumferences	Volleyball	100	84.89	6.51	5.518**
		Basketball players	100	89.04	3.75	

**Significant at 0.01 level of significance



Graph No.2 Comparison of Mean Values Between University Volleyball and Basketball Men Players Regarding Soldiers Circumferences, Chest Circumferences, Abdomen Circumferences and Hip Circumferences

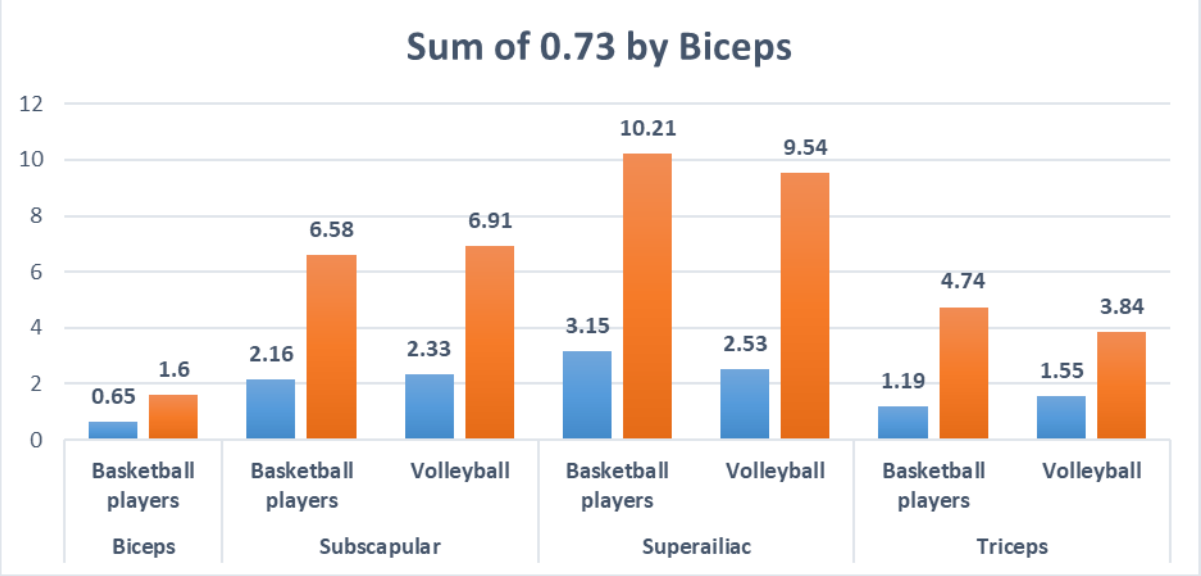
The a b o v e table represents the significance of mean difference of University Volleyball and Basketball men players regarding their soldier circumferences, chest circumferences, abdomen circumferences and hip circumferences. The mean values of University Volleyball and Basketball men players regarding soldier circumference were 96.41 and 102.45 respectively. The calculated 't' value is 5.292 which is significant at 0.01 level of significance. So there is a significant difference in soldier circumference of University Volleyball and Basketball men players. The higher mean score shows that the soldier circumference of Basketball players is higher as compared with the height of Volleyball.
The mean values of Volleyball and Basketball players regarding hip circumference were 84.89 and 89.04 respectively. The calculated 't' value is 5.518 which is significant at 0.01 level of significance. So there is a significant difference in hip circumference of Volleyball and Basketball players. The higher mean score shows that the hip circumference of Basketball players is much higher as compared to the hip circumference of Volleyball.

Table No: 4 : Comparison of Mean Values Between Volleyball and Basketball Players Regarding Biceps, Triceps, Subscapular and Superaliac

S. No.	Variable	Group	N	Mean Scores	S.D's	t-value
1.	Biceps	Volleyball	100	1.52	0.73	2.173*
		Basketball players	100	1.60	0.65	
2.	Triceps	Volleyball	100	3.84	1.55	4.588**
		Basketball players	100	4.74	1.19	

3.	Subscapular	Volleyball	100	6.91	2.33	1.025^{NS}
		Basketball players	100	6.58	2.16	
4.	Superailiac	Volleyball	100	9.54	2.53	1.655^{NS}
		Basketball players	100	10.21	3.15	

* Significant at 0.05 level; **Significant at 0.01 level; NS = Not significant



Graph:3 Comparison of Mean Values Between Volleyball and Basketball Players Regarding Biceps, Triceps, Subscapular and Superaliac

The above table represents the significance of mean difference of Volleyball a n d Basketball players regarding their biceps, triceps, subscapular and superaliac. The mean values of Volleyball a n d Basketball players regarding biceps were 1.60 and 1.52 respectively. The calculated 't' value is 2.173 which is significant at 0.05 level of significance. So there is a significant difference in biceps of Volleyball and Basketball players. The higher mean score shows that the biceps of Basketball players is higher as compared with the biceps of Volleyball.

The last part of the table shows that the mean values of Volleyball and Basketball players regarding total superailiac were 9.54 and 10.21 respectively. The calculated 't' value is 1.655 which is not significant at any level of significance. So there is no significant difference in superailiac of Volleyball and Basketball players. It shows that the superailiac of Basketball and Volleyball is almost the same.

Table No:5

Comparison of Mean Values Between Volleyball and Basketball Players Regarding Heart Rate

S. No.	Variable	Group	N	Mean Scores	S.D's	t-value
1.	Heart Rate	Volleyball	100	63.22	7.291	0.254NS
		Basketball players	100	62.99	5.361	

NS = Not significant

The above table represents the significance of mean difference of Volleyball a n d Basketball players regarding their heart rate. The mean values of Volleyball a n d Basketball players regarding heart rate were 63.22 and 62.99 respectively. The

calculated 't' value is 0.254 which is not significant at any level of significance. So there is no significant difference in heart rate of Volleyball and Basketball players. No significant difference shows that Volleyball and Basketball players almost have same type of heart rate.

Table No: 6 Comparison of Mean Values Between Volleyball and Basketball Players Regarding Vital Capacity

S.No.	Variable	Group	N	Mean Scores	S.D's	t-value
1.	Vital Capacity	Volleyball players	100	404.83	120.74	0.972(NS)
		Basketball players	100	390.02	92.92	

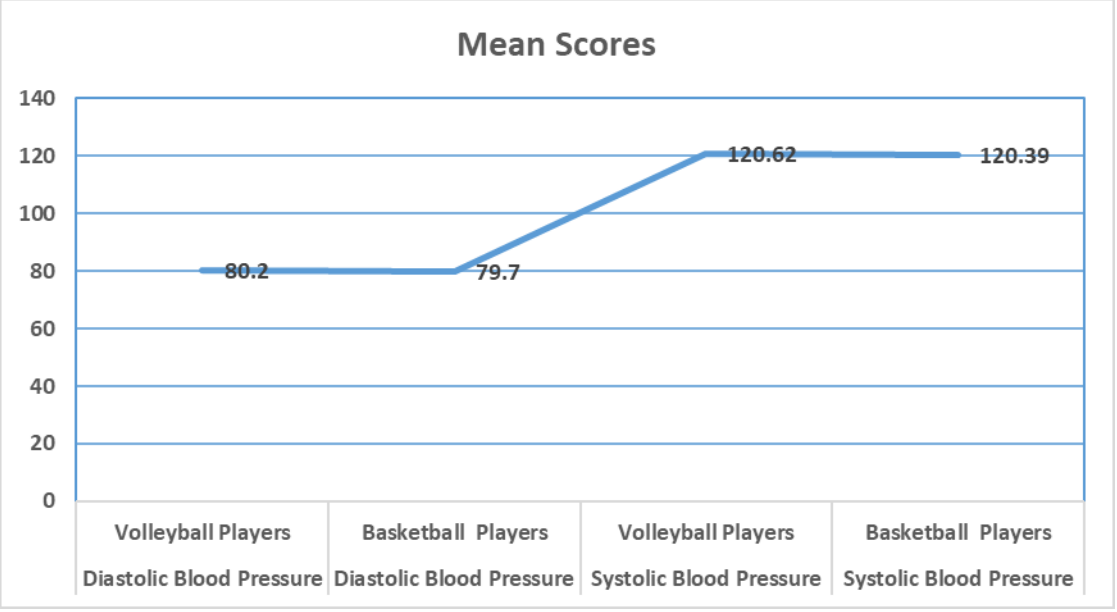
(NS) Not Significant

The above table represents that the mean values of Volleyball and Basketball players regarding vital capacity were 404.83 and 390.02 respectively. The calculated 't' value is 0.972 which is not significant at any level of significance. So there is no significant difference in vital capacity of Volleyball and Basketball players.

Table No:7 Comparison of Mean Values Between Volleyball and Basketball Players Regarding Diastolic and Systolic Blood Pressures

S.No	Variable	Group	N	Mean Scores	S.D's	t-value
1.	Diastolic Blood Pressure	Volleyball players	100	80.20	2.256	1.904(NS)
		Basketball players	100	79.70	1.345	
2.	Systolic Blood Pressure	Volleyball players	100	120.62	2.347	0.852(NS)
		Basketball players	100	120.39	1.333	

*Significant at 0.05 level of significance (NS) Not significant



Graph 4: Comparison of Mean Values Between Volleyball and Basketball

The above table represents the significance of mean difference of Volleyball a n d Basketball players regarding their systolic and diastolic blood pressures. The mean values of Volleyball and Basketball players regarding diastolic blood pressures were 80.20 and 79.70 respectively. The calculated 't' value is 1.904 which is not significant at any level of significance. So there is no significant difference in diastolic blood pressure of Volleyball and Basketball players. The mean values of Volleyball a n d Basketball players regarding systolic blood pressures were 120.62 and 120.39 respectively. The calculated 't' value is 0.852 which is not significant at any level of significance. So there is no significant difference in systolic blood pressure of Volleyball and Basketball players.

18. FINDINGS

- A significant difference was noticed in weight of Volleyball and Basketball players. The weight of Basketball players is more than Volleyball players.
- A significant difference was noticed in height of Volleyball and Basketball players. Height of Basketball players is more than height of Volleyball players.
- A significant difference was noticed in total leg length of Volleyball and Basketball players. Total leg length of Basketball players is more than the height of Volleyball players.
- A significant difference was noticed in total arm length of Volleyball and Basketball players. Total arm length of Basketball players is more than the height of Volleyball players.
- A significant difference was noticed in sitting height of Volleyball and Basketball players. Sitting height of Basketball players is more than the height of Volleyball players.
- A significant difference was noticed in soldier circumference of Volleyball and Basketball players. Soldier circumference of Basketball players is more than the height of Volleyball players.
- A significant difference was noticed in chest circumference of Volleyball and Basketball players. Chest circumference of Basketball players is more than the chest circumference of Volleyball players.
- A significant difference was noticed in abdomen circumference of Volleyball and Basketball players. Abdomen circumference of Basketball players is more than the abdomen circumference of Volleyball players.
- A significant difference was noticed in hip circumference of Volleyball and Basketball players. Hip circumference of Basketball players is more than the hip circumference of Volleyball players.
- A significant difference was noticed in biceps of Volleyball and Basketball players. Biceps of Basketball players is more than the biceps of Volleyball players.
- A significant difference was noticed in triceps of Volleyball and Basketball players. Triceps of Basketball players is more than the triceps of Volleyball players.
- No significant difference occurred in subscapular of Volleyball and Basketball players. In subscapular, Basketball and Volleyball men players is almost the same.
- No significant difference occurred in superailiac of Volleyball and Basketball players. It shows that the superailiac of Basketball and Volleyball men players is almost the same.
- No significant difference occurred in heart rate of Volleyball and Basketball players. No significant difference shows that Volleyball and Basketball players almost have same type of heart rate.

From the aforesaid discussion it is clear that there is acute shortage of studies related to physiological and anthropometric variables. **Sathya, Kadhiravan, Ramakrishnan, &Vedak (2013)** and Singh (2016) conducted researches on Volleyball and Basketball game players, but most of his studies were relative studies. There are few studies conducted in India on these variables. So there is a dire need to do research on the physiological and anthropometric variables.

19. TESTING OF HYPOTHESES:

From the results, it is clear that Basketball players possess more weight, height, total leg length, total arm length and sitting height than those of Volleyball players. Hence the hypothesis (No. 1) "There is no significant difference in linear measurements between Volleyball and Basketball players of universities" is rejected.

In case of body circumferences Basketball players possess more in shoulder circumferences, chest circumferences, abdomen circumferences, and hip circumferences than those of Volleyball players. Hence the hypothesis (No. 2) "There is no significant differences in body circumferences between Volleyball and Basketball players of universities" is rejected.

Furthermore, the skin-fold variables, Basketball players possess more in biceps and triceps than Volleyball players. But no significant difference was found in sub-scapular and superaliac between Basketball and Volleyball men players.

Hence the hypotheses (No. 3) "There is no significant difference in skin fold measurement like biceps, triceps, sub scapular and superalliac between Volleyball and Basketball players of universities" is partially accepted and partially rejected.

In case of the physiological parameters, i.e. heart rate, vital capacity, blood pressure, Basketball and Volleyball men players do not differ significantly on these parameters. Hence the hypotheses (4) "There is no significant difference in Physiological variables i.e. heart rate, vital capacity, blood pressure and of Volleyball and Basketball players of universities" is accepted.

20. SUGGESTIONS AND RECOMMENDATIONS:

The research has given various suggestions and recommendation on the basis of findings of the study which are described as under:

1. The same type of research can be carried out by choosing the respondents pertaining to various levels and age participated in their respective games and sports.
2. The results of the investigation can be used as a tool by coaches and physical trainers in selecting and secruting talented performers.
3. For such type of research, more facilities, training and practice with instruments are essential for better results.
4. The same type of research can be carried out by opting motor fitness and physiological measures of players.
5. In order to determine the specific anthropometric characteristics of different games or sports, same type of study can be undertaken in other players or athletes.
6. Appreciable incentives to research personals in physical education and sports should be provided for standard research work.
7. More facilities for research in physical education and sports should be provided for smooth conduct and better results.
8. The preset study will be of immense use for further research in the field.
9. Such types of studies will help the physical education teachers, trainers and coaches to find out the best talent among the participants according to their selected anthropometric variables.
10. The more findings of such studies should be made available to all physical education teachers and coaches so that they may come to know and try to implement the findings for better performance.

21. LIMITATIONS

Certain factors like regions, age, dietary patters, daily routine, lifestyle, habits etc., which might have an effect on the result of the study couldn't be controlled and therefore these were considered as limitations of the study.

22. CONCLUSION

The conclusion of the study confirmed that a significant difference was noticed in anthropological and physiological variables - weight, height, total leg length, total arm length, sitting height, soldier circumference, chest circumference, abdomen circumference, hip circumference, biceps, triceps of Volleyball and Basketball players. These anthropological and physiological variables of Basketball players were found higher in comparison to Volleyball players. Regarding subscapular, superailiac, heart rate, vital capacity, diastolic and blood pressure of Volleyball and Basket ballplayers, no significant difference was found.

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