CHAPTER IV

RESULTS

AND DISCUSSIONS
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RESULTS AND DISCUSSIONS

4.1. OVERVIEW

This chapter deals with the test of significance, level of significance, analysis of data, discussion on findings and hypothesis.

4.2. TEST OF SIGNIFICANCE

This is the critical portion of the thesis in arriving at the conclusion by examining the hypothesis. The procedure of testing the hypothesis in accordance with the results obtained in relation to the level of confidence which was fixed at 0.05 level, was considered as sufficient for this study.

The test is usually called the test of significance since we compare the scores to find out whether it is significant or not. In the present study, if the obtained F-ratio was greater than the table F-ratio at 0.05 level, then the hypothesis was accepted to the extent that there existed significant difference between the means of groups compared. If the obtained F-ratio was less than the table F-ratio at 0.05 level, then the hypothesis had to be rejected in that there existed no significant difference between the means of the groups under study.

4.2.1. LEVEL OF SIGNIFICANCE

The probability level below which we reject the hypothesis, is termed as the level of significance. The F-ratio obtained by analysis of variance need 3.109 for significance at 0.05 level for the degrees of freedom 2 and 87. In addition to that, the significant difference between the paired
adjusted means were tested by computing the confidence interval, utilising the Scheffe's post-hoc test in which if the obtained mean difference value was greater than the confidence interval value, it was considered as significant.

4.3. COMPUTATION OF ONE WAY ANALYSIS OF VARIANCE AND POST-HOC TESTS

The following tables illustrate the statistical results of one way analysis of variance of the selected body composition, anthropometric and physiological variables of Football, Basketball and Volleyball university men players and also Scheffe's post-hoc test ordered mean differences between various players.
Table II shows the one way analysis of variance of age of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 0.59 is less than the table F-ratio 3.109, the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of age among university men Football, Basketball and Volleyball players are presented in figure-I.
FIGURE 1: THE MEAN VALUES OF AGE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.1. DISCUSSION ON THE FINDINGS OF AGE

The findings of age showed that there was no significant difference among university men Football, Basketball and Volleyball players. Since, the age of university men Football, Basketball and Volleyball players ranged from 18 - 25 years, the age of the subjects selected for this study was about 20 years. Hence, there was no significant difference in age among men university Basketball, Volleyball and Football players.
Table III shows the one way analysis of variance of body weight of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 7.57 is greater than the table F-ratio 3.109, the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table III-A shows the Scheffe's Post-hoc test of body weight of university men Football, Basketball and Volleyball players.
From this table, it is clear that the mean values of Basketball, Volleyball and Football players are 59.18, 61.06 and 63.35 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and also Volleyball and Football players are 4.71, 2.42 and 1.72 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 2.94, 3.15 and 2.49 respectively. Hence, there is significant difference between Basketball and Football players; whereas in regard to Basketball and Volleyball players and Football and Volleyball players the differences are insignificant.

The mean values of body weight among university men Football, Basketball and Volleyball players are presented in figure-II.
FIGURE II: THE MEAN VALUES OF BODY WEIGHT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.2. DISCUSSION ON THE FINDINGS OF BODY WEIGHT

From the findings of the study, it was found that there was significant difference in body weight among university men Football, Basketball and Volleyball players. Since the university Football, Basketball and Volleyball players require specific structure shape and body types, the body weight of the players too differ from game to game. The findings of the study has found support from Mokha and Sidhu¹.

TABLE IV
ONE WAY ANALYSIS OF VARIANCE OF HEIGHT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF*</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2548.06</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>1081.75</td>
<td>2</td>
<td>540.88</td>
<td>32.10*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>1466.31</td>
<td>87</td>
<td>16.85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table IV shows the one way analysis of variance of height of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 32.10 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table IV-A shows the Scheffe's Post-hoc test of height of university men Football, Basketball and Volleyball players.

TABLE IV-A
ORDERED SCHEFFE'S POST-HOC TEST FOR HEIGHT MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>168.24</td>
<td>174.27</td>
<td></td>
<td>6.03*</td>
<td>2.51</td>
</tr>
<tr>
<td>168.24</td>
<td>176.45</td>
<td></td>
<td>8.21*</td>
<td>2.89</td>
</tr>
<tr>
<td></td>
<td>174.27</td>
<td>176.27</td>
<td>2.18</td>
<td>2.89</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 168.24, 174.27 and 176.45 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and also Volleyball and Football players are 6.03, 2.18 and 8.21 respectively. The confidence interval value of Basketball and Football players; Basketball and Volleyball players and also Volleyball and Football players are 2.51, 2.89 and 2.89 respectively. Hence, there is no significant difference between Basketball players and Volleyball players and there is significant difference between Basketball and Football players and also Football and Volleyball players.

The mean values of height among university men Football, Basketball and Volleyball players are presented in figure-III.
FIGURE III: THE MEAN VALUES OF HEIGHT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.3. DISCUSSION ON THE FINDINGS OF HEIGHT

The one way analysis of variance of height showed that there was significant difference in height among the university men Football, Basketball and Volleyball players. Since, the university Football, Basketball and Volleyball players require a specific structure and body shape, the height of the players too differ from game to game; hence there was significant difference among the players. These findings are in agreement with the findings of Subir Kumar, Bose, Khanna and Banerjee\(^2\) who have conducted a study on height and found it was a very important factor in determining the players performance in Football, Basketball and Volleyball.

Table V shows the one way analysis of variance of sitting height of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 6.46 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe’s post-hoc test was used to analyse the paired mean significant difference.

Table V-A shows the Scheffe’s Post-hoc test of sitting height of university men Football, Basketball and Volleyball players.
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 75.02, 78.93 and 76.00 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 3.91, 2.93 and 0.98 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 3.06, 2.58 and 3.27 respectively. Hence, there is significant difference between basket ball and Volleyball players and Basketball and Football players. However, the difference between Football and Volleyball players is found insignificant.

The mean values of sitting height among university men Football, Basketball and Volleyball players are presented in figure-IV.
FIGURE IV: THE MEAN VALUES OF SITTING HEIGHT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.4. DISCUSSION ON THE FINDINGS OF SITTING HEIGHT

The one way analysis of variance showed that there was statistical significant difference in sitting height of university men Football, Basketball and Volleyball players. Since, these players require a specific body type, shape, structure and body components for specific games, the sitting height of Football, Basketball and Volleyball players too differ from each other. The findings of the study is in concur with the inferences of Sodhi, Sandhu and Jaswinder Singh\(^3\).

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**TABLE VI**

ONE WAY ANALYSIS OF VARIANCE OF LOWER LIMB LENGTH AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS

(Scores in centimetres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4971.16</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>764.25</td>
<td>2</td>
<td>382.13</td>
<td>7.90*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>4206.91</td>
<td>87</td>
<td>48.36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table VI shows the one way analysis of variance of lower limb length of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 7.90 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table VI-A shows the Scheffe's Post-hoc test of lower limb length of university men Football, Basketball and Volleyball players.

**TABLE VI-A**

ORDERED SCHEFFE'S POST-HOC TEST FOR LOWER LIMB LENGTH MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS

(Scores in centimetres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>83.16</td>
<td>88.66</td>
<td></td>
<td>5.50*</td>
<td>4.905</td>
</tr>
<tr>
<td>83.16</td>
<td></td>
<td>89.65</td>
<td>6.49*</td>
<td>4.905</td>
</tr>
<tr>
<td></td>
<td>88.66</td>
<td>89.65</td>
<td>0.99</td>
<td>4.905</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 83.16, 88.66 and 89.65 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 5.50, 0.99 and 6.49 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 4.905, 4.233 and 4.905 respectively. Hence, there is significant difference between Basketball and Football players and Football and Volleyball players. However, the difference between Basketball and Volleyball players is insignificant.

The mean values of lower limb length among university men Football, Basketball and Volleyball players are presented in figure-V.
FIGURE V: THE MEAN VALUES OF LOWER LIMB LENGTH AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.5. DISCUSSION ON THE FINDING OF LOWER LIMB LENGTH

The one way analysis of variance of lower limb length revealed that there was statistical significant difference in lower limb length among university men Football, Basketball and Volleyball players. Since, the university men Football, Basketball and Volleyball players require a specific structure for a specific game, the lower limb length of these players too differ from one another. Hence, there was significant difference among the players. These findings are in agreement with the findings of Metheny\(^4\) who conducted a study to find out the lower limb length to be an important factor in determining the players performance in Football, Basketball and Volleyball.

TABLE VII
ONE WAY ANALYSIS OF VARIANCE OF UPPER LIMB LENGTH AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2882.06</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>247.06</td>
<td>2</td>
<td>123.53</td>
<td>4.08*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>2635.00</td>
<td>87</td>
<td>30.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table VII shows the one way analysis of variance of upper limb length of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 4.08 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffes post-hoc test was used to analyse the paired mean significant difference.

Table VII-A shows the Scheffe's Post-hoc test of upper limb length of university men Football, Basketball and Volleyball players.

TABLE VII-A
ORDERED SCHEFFE'S POST-HOC TEST FOR UPPER LIMB LENGTH MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>73.30</td>
<td>76.57</td>
<td></td>
<td>3.27*</td>
<td>3.27</td>
</tr>
<tr>
<td>73.30</td>
<td></td>
<td>76.80</td>
<td>3.50</td>
<td>3.80</td>
</tr>
<tr>
<td>76.57</td>
<td>76.80</td>
<td>0.23</td>
<td>3.88</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
FIGURE VI: THE MEAN VALUES OF UPPER LIMB LENGTH AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.6. DISCUSSION ON THE FINDING OF UPPER LIMB LENGTH

From the findings of the study it was evident that there was significant difference in upper limb length among the university Football, Basketball and Volleyball players. Since, these players require a specific body type, shape and structure, the upper limb length of players differed from one game to another game. The findings of the study is in concurrence with the inferences of Tanner$^5$.

Table VIII shows the one way analysis of variance of humerus width of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 0.38 is less than the table F-ratio 3.109, the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of humerus width among university men Football, Basketball and Volleyball players are presented in figure-VII.
FIGURE VII: THE MEAN VALUES OF HUMERUS WIDTH AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.7. DISCUSSION ON THE FINDINGS OF HUMERUS WIDTH

The findings of the humerus width revealed that there was no significant difference among university men Football, Basketball and Volleyball players. It may due to the similar structure of university men Football, Basketball and Volleyball players. The findings of the study is supported by Tanner*. 

Table IX shows the one way analysis of variance of femur width of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 1.73 is less than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of femur width among university men Football, Basketball and Volleyball players are presented in figure-VIII.
FIGURE VIII: THE MEAN VALUES OF FEMUR WIDTH AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.8. DISCUSSION ON THE FINDINGS OF FEMUR WIDTH

From the finding of the study, it was found that there was no significant difference among university men Football, Basketball and Volleyball players. The femur width of university Football, Basketball and Volleyball are similar. It may be due to the similar shape and structure among the players. The finding of the study is supported by Tanner\textsuperscript{7}.

\textsuperscript{7}Ibid., p.35.
Table X shows the one way analysis of variance of chest circumference of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 2.18 is less than the table F-ratio 3.109, the result of the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of humerus width among university men Football, Basketball and Volleyball players are presented in figure-IX.
FIGURE IX: THE MEAN VALUES OF CHEST CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.9. DISCUSSION ON THE FINDINGS OF CHEST CIRCUMFERENCE

The one way analysis of variance of chest circumference indicated that there was no significant difference in the chest circumference among university men Football, Basketball and Volleyball players. Since these players had a similar chest circumference, they do not differ from each other. The findings of the study is supported by Tanner\textsuperscript{8}.

\textsuperscript{8}Ibid., P.51.
Table XI shows the one way analysis of variance of abdominal circumference of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 1.17 is less than the table F-ratio 3.109, the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of abdominal circumference among university men Football, Basketball and Volleyball players are presented in figure-X.
FIGURE X: THE MEAN VALUES OF ABDOMINAL CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.10. DISCUSSION ON THE FINDINGS OF ABDOMINAL CIRCUMFERENCE

From the findings of the study, it has been seen that there was no significant difference in abdominal circumference among university men Football, Basketball and Volleyball players. Since these players had a similar abdominal circumference, they do not differ from each other: The findings of the study is supported by Tanner.\(^a\)

\(^a\)Ibid., P.66.
### TABLE XII
**ONE WAY ANALYSIS OF VARIANCE OF RELAXED ARM CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS**
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>610</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>67</td>
<td>2</td>
<td>33.50</td>
<td>5.37*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>543</td>
<td>87</td>
<td>6.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XII shows the one way analysis of variance of relaxed arm circumference of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 5.37 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc was used to analyse the paired mean significant difference.

Table XII-A shows the Scheffe's post-hoc test of relaxed arm circumference of university men Football, Basketball and Volleyball players.

### TABLE XII-A
**ORDERED SCHEFFE'S POST-HOC TEST FOR RELAXED ARM CIRCUMFERENCE MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS**
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.72</td>
<td>26.30</td>
<td></td>
<td>0.42</td>
<td>1.75</td>
</tr>
<tr>
<td>26.72</td>
<td>28.33</td>
<td></td>
<td>1.61*</td>
<td>1.39</td>
</tr>
<tr>
<td>28.33</td>
<td>26.30</td>
<td></td>
<td>2.03*</td>
<td>1.64</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 26.72, 28.33 and 26.30 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.61, 2.03 and 0.42 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.39, 1.64 and 1.75 respectively. Hence, there is significant difference between Basketball and Volleyball players, Basketball and Football players. However, there is insignificant difference between Football and Volleyball players.

The mean values of relaxed arm circumference among university men Football, Basketball and Volleyball players are presented in figure-XI.
FIGURE XI: THE MEAN VALUES OF RELAXED ARM CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.11. DISCUSSION ON THE FINDINGS OF RELAXED ARM CIRCUMFERENCE

Results revealed that there was significant difference in relaxed arm circumference of university men Football, Basketball and Volleyball players. Since, these categories of players need a specific body type and components for specific game, the relaxed arm circumference of these players differ from each other. The results of the study is supported by Mokha and Sidhu\textsuperscript{10}.

\textsuperscript{10}R. Mokha and L.S. Sidhu, \textit{Loc.cit.},
TABLE XIII
ONE WAY ANALYSIS OF VARIANCE OF FLEXED ARM CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>410.49</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>112.86</td>
<td>2</td>
<td>56.43</td>
<td>16.50*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>297.63</td>
<td>87</td>
<td>3.42</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XIII shows the one way analysis of variance of flexed arm circumference of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 16.50 is greater than the table F ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc was used to analyse the paired mean significant difference.

Table XII-A shows the Scheffe's post-hoc test of flexed arm circumference of university men Football, Basketball and Volleyball players.

TABLE XIII-A
ORDERED SCHEFFE'S POST-HOC TEST FOR FLEXED ARM CIRCUMFERENCE MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.10</td>
<td>25.57</td>
<td>1.47*</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>24.10</td>
<td>27.00</td>
<td>2.90*</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>25.57</td>
<td>27.00</td>
<td>1.43*</td>
<td>1.13</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 24.10, 25.57 and 27.00 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.47, 1.43 and 2.90 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.30, 1.13 and 1.30 respectively. Hence, there is significant difference between Basketball and Volleyball players; Basketball and Football players and Football and Volleyball players.

The mean values of flexed arm circumference among university men Football, Basketball and Volleyball players are presented in figure-XII.
FIGURE XII: THE MEAN VALUES OF FLEXED ARM CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.12. DISCUSSION ON THE FINDINGS OF FLEXED ARM CIRCUMFERENCE

The one way analysis of variance has indicated that there was significant difference in flexed arm circumference of university men Football, Basketball and Volleyball players. Since these players require a particular body shape, size and body components for specific game, the flexed arm circumference of these players differ from one another. These findings are in agreement with the findings of Mokha and Sidhu.\(^{11}\)

TABLE XIV
ONE WAY ANALYSIS OF VARIANCE OF CALF CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>302</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>32</td>
<td>2</td>
<td>16.00</td>
<td>5.16*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>270</td>
<td>87</td>
<td>3.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XIV shows the one way analysis of variance of calf circumference of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 5.16 is greater than the table F-ratio 3.109, the study is statistically significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XIV-A shows the Scheffe's post-hoc test of calf circumference of university men Football, Basketball and Volleyball players.

TABLE XIV-A
ORDERED SCHEFFE'S POST-HOC TEST FOR CALF CIRCUMFERENCE MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in centimetres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.75</td>
<td>31.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.75</td>
<td>30.45</td>
<td>0.30</td>
<td>1.24</td>
<td></td>
</tr>
<tr>
<td>31.87</td>
<td>30.45</td>
<td>1.42*</td>
<td>1.15</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 30.75, 31.87 and 30.45 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.12, 1.42 and 0.30 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 0.98, 1.15 and 1.24 respectively. Hence, there is significant difference between Basketball and Volleyball players and Basketball and Football players. Whereas, in regard to Football and Volleyball players, the difference is insignificant.

The mean values of calf circumference among university men Football, Basketball and Volleyball players are presented in figure-XIII.
FIGURE XIII: THE MEAN VALUES OF CALF CIRCUMFERENCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.13. DISCUSSION ON THE FINDINGS OF CALF CIRCUMFERENCE

The one way analysis of variance revealed that there was significant difference in calf circumference of university men Football, Basketball and Volleyball players. Since these players require a specific body shape, size and structure for every specific game, calf-circumference of these players differ from one another. The findings of the study is supported by Bawa and Debnath.\textsuperscript{12}

Table XV shows the one way analysis of variance of sum of six skinfolds of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 0.36 is less than the table F-ratio 3.109, the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of sum of six skinfolds among university men Football, Basketball and Volleyball players are presented in figure-XIV.
FIGURE XIV: THE MEAN VALUES OF SUM OF SIX SKINFOLDS AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.14. DISCUSSION ON THE FINDINGS OF SUM OF SIX SKINFOLDS

The finding of the study indicated that there was no significant difference on the sum of six skinfolds of university men Football, Basketball and Volleyball players. Since these players had a similar sum of six skinfolds they do not differ from each other. The findings of the study is supported by Bawa and Debanath\textsuperscript{13}.

\textsuperscript{13}Ibid., P.66.
TABLE XVI
ONE WAY ANALYSIS OF VARIANCE OF PONDERAL INDEX AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS (Scores in points)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>397</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>81</td>
<td>2</td>
<td>40.50</td>
<td>11.16*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>316</td>
<td>87</td>
<td>3.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XVI shows the one way analysis of variance of ponderal index of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 11.16 is greater than the table F-ratio 3.109, the study is statistically significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc was used to analyse the paired mean significant difference.

Table XVI-A shows the Scheffe's post-hoc test of ponderal index of university men Football, Basketball and Volleyball players.

TABLE XVI-A
ORDERED SCHEFFE'S POST-HOC TEST FOR PONDERAL INDEX MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS (Scores in points)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.25</td>
<td>43.63</td>
<td></td>
<td>1.38*</td>
<td>1.34</td>
</tr>
<tr>
<td>42.24</td>
<td>44.68</td>
<td></td>
<td>2.43*</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>43.63</td>
<td>44.68</td>
<td>1.05</td>
<td>1.06</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 42.25, 43.63 and 44.68 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.38, 1.05 and 2.43 respectively. The confidence interval values of Basketball and Football players; Basket and Volleyball and Football and Volleyball players are 1.35, 1.06 and 1.25 respectively. Hence, there is significant difference between Basketball and Volleyball players and Basketball and Football players. However, there is no significant difference between Football and Volleyball players.

The mean values of ponderal index among university men Football, Basketball and Volleyball players are presented in figure-XV.
FIGURE XV: THE MEAN VALUES OF PONDERAL INDEX AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.15. DISCUSSION ON THE FINDINGS OF PONDERAL INDEX

Results indicated that there was significant difference in ponderal index of university men Football, Basketball and Volleyball players. Since these categories of players need a specific shape and structure for each game, the ponderal index of the players differ from one another. The findings of the study is supported by Bawa and Debanath\textsuperscript{14}.

\textsuperscript{14}Ibid., P.38.
Table XVII shows the one way analysis of variance of skelic index of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 3.73 is greater than the table F-ratio 3.109, the study is statistically significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc was used to analyse the paired mean significant difference.

Table XVII-A show the Scheffe's post-hoc test of skelic index of university men Football, Basketball and Volleyball players.

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 115.81, 112.65 and 122.92 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 3.16, 10.27 and 7.11 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Football and Volleyball players are 9.38, 8.77 and 7.41 respectively. Hence, there is significant difference between Basketball and Volleyball players; whereas, the difference between Basketball and Football players and Football and Volleyball players is found insignificant.

The mean values of skelic index among university men Football, Basketball and Volleyball players are presented in figure-XVI.
FIGURE XVI: THE MEAN VALUES OF SKELIC INDEX AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.16. DISCUSSION ON THE FINDINGS OF SKELIC INDEX

The one way analysis of variance revealed that there was significant difference in skelic index of university men Football, Basketball and Volleyball players. Since these players require a particular body structure and body components for specific game, the skelic index of these players differ from each other. The result of the study is supported supported by Bawa and Debanath\textsuperscript{15}.

\textsuperscript{15}Ibid., P.50.
### Table XVIII

**One Way Analysis of Variance of Endomorphy Among University Men Football, Basketball and Volleyball Players**

(Scores in points)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>59</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>1</td>
<td>2</td>
<td>0.50</td>
<td>0.75</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>58</td>
<td>87</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Table XVIII shows the one way analysis of variance of endomorphy of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 0.75 is less than the table F-ratio 3.109, the study is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence the Scheffe's post-hoc test was not used to analyse the paired mean significant difference.

The mean values of endomorphy among university men Football, Basketball and Volleyball players are presented in figure-XVII.
FIGURE XVII: THE MEAN VALUES OF ENDOMORPHY AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.17. DISCUSSION ON THE FINDINGS OF ENDOMORPHY

The findings of the study indicated that there was no significant difference in the endomorphy of university men Football, Basketball and Volleyball players. Since these players in the respective category do not differ from each other, it was statistically found that there was no significance in endomorphy of university men Football, Basketball and Volleyball players when compared with their counterparts in other disciplines. It may be due to the similarity in size and shape of the players. The findings of the study is supported by Bawa and Debanath\textsuperscript{16}.

\textsuperscript{16}Ibid., P.36.
Table XIX shows the one way analysis of variance of mesomorphy of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 21.25 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XIX-A shows the Scheffe's Post-hoc test of mesomorphy of university men Football, basketball and volleyball players.
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 2.67, 1.84 and 2.87 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 0.83, 1.03 and 0.2 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and also Volleyball and Football players are 0.44, 0.41 and 0.35 respectively. Hence, there is significant difference between Basketball and Volleyball players and Basketball and Football players. The difference in the case of Football and Volleyball players is insignificant.

The mean values of mesomorphy among university men Football, Basketball and Volleyball players are presented in figure-XVIII.
FIGURE XVIII: THE MEAN VALUES OF MESOMORPHY AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.18. DISCUSSION ON THE FINDINGS OF MESOMORPHY

The one way analysis of variance showed that there was statistical significant difference in mesomorphy of university men Football, Basketball and Volleyball players. Since these players require a specific body shape, structure and body components for specific games, the important factor mesomorphy of these players differ from each other. The findings of the study is supported by Sodhi and Rajni.¹⁷

TABLE XX
ONE WAY ANALYSIS OF VARIANCE OF ECTOMORPHY AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in points)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>302</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>90</td>
<td>2</td>
<td>45.00</td>
<td>18.44*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>212</td>
<td>87</td>
<td>2.44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XX shows the one way analysis of variance of ectomorphy of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 18.44 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XX-A shows the Scheffe's Post-hoc test of ectomorphy of university men Football, Basketball and Volleyball players.

TABLE XX-A
ORDERED SCHEFFE'S POST-HOC TEST FOR ECTOMORPHY MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in points)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.21</td>
<td>3.30</td>
<td></td>
<td>1.09*</td>
<td>1.10</td>
</tr>
<tr>
<td>2.21</td>
<td></td>
<td>4.85</td>
<td>2.64*</td>
<td>1.02</td>
</tr>
<tr>
<td></td>
<td>3.30</td>
<td>4.85</td>
<td>1.55*</td>
<td>0.86</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 2.21, 3.30 and 4.85 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.09, 1.55 and 2.64 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.10, 0.86 and 1.02 respectively. Hence, there is significant difference between Basketball and Volleyball players and Football and Volleyball players. The difference in the case of Basketball and Football players is insignificant.

The mean values of ectomorphy among university men Football, Basketball and Volleyball players are presented in figure-XIX.
FIGURE XIX: THE MEAN VALUES OF ECTOMORPHY AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.19. DISCUSSION ON THE FINDINGS OF ECTOMORPHY

The findings of the study determined that there was significant difference in ectomorphy of university men Football, Basketball and Volleyball players. Since these players require a particular body shape, size and body components for specific game the ectomorphy of these players differ from one another. The findings of the study is supported by Heath and Carter\textsuperscript{18}.

\textsuperscript{18}Heath B. and Carter J., as cited by J. Blom field, T.R. Ackland and B.C. Elliott, \textit{op.cit.}, P.55.
**TABLE XXI**

ONE WAY ANALYSIS OF VARIANCE OF PERCENT FAT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS

(Scores in percentage)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>309</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>26</td>
<td>2</td>
<td>13.00</td>
<td>4.00*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>283</td>
<td>87</td>
<td>3.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XXI shows the one way analysis of variance of percent fat of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 4.00 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XXI-A is shows the Scheffe's post-hoc test of percent fat of university men Football, Basketball and Volleyball players.

**TABLE XXI-A**

ORDERED SCHEFFE'S POST-HOC TEST FOR PERCENT FAT MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS

(Scores in percentage)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.97</td>
<td>22.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.97</td>
<td></td>
<td>22.76</td>
<td>1.21*</td>
<td>1.18</td>
</tr>
<tr>
<td>23.97</td>
<td>23.48</td>
<td>22.76</td>
<td>0.49</td>
<td>1.00</td>
</tr>
<tr>
<td>22.76</td>
<td></td>
<td>23.48</td>
<td>0.72</td>
<td>1.26</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 23.97, 22.76 and 23.48 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.21, 0.72 and 0.49 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.18, 1.26 and 1.21 respectively. There is significant difference between Basketball and Football players; whereas, the difference between Basketball and Volleyball players and Football and Volleyball players are found insignificant.

The mean values of percent fat among university men Football, Basketball and Volleyball players are presented in figure-XX.
FIGURE XX: THE MEAN VALUES OF PERCENT FAT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.20. DISCUSSION ON THE FINDINGS OF PERCENT FAT

The one way analysis of variance revealed that there was significant difference in percent fat of university men Football, Basketball and Volleyball players. Since these players require a specific structure for a specific game, the percent fat of these players differ from one another. These findings are in agreement with the findings of Piechagek.19

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Table XXII shows the one way analysis of variance of absolute fat of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 5.99 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XXII-A shows the Scheffe's Post-hoc test of absolute fat of university men Football, Basketball and Volleyball players.
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 15.23, 13.55 and 14.48 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.68, 0.93 and 0.75 respectively. The confidence interval values of Basketball and Football players, Basketball and Volleyball players and Volleyball and Football players are 1.31, 1.41 and 1.11 respectively. Hence, there is significant difference between Basketball and Football players. However, there is no significant difference between Basketball and Volleyball players and Football and Volleyball players.

The mean values of absolute fat among university men Football, Basketball and Volleyball players are presented in figure-XXI.
FIGURE XXI: THE MEAN VALUES OF ABSOLUTE FAT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.21. DISCUSSION ON THE FINDINGS OF ABSOLUTE FAT

From the findings of the study, it was observed that there was significant difference in absolute fat among university men Football, Basketball and Volley ball players. Since these groups require a specific body type and body components, the absolute fat of these players differ from game to game. The findings of the study is supported by Malina et.al.\textsuperscript{20}

Table XXIII shows the one way analysis of variance of lean body weight of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 5.62 is greater than the table F ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XXIII-A shows the Scheffe's Post-hoc test of lean body weight of university men Football, Basketball and Volleyball players.

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>952</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>109</td>
<td>2</td>
<td>54.50</td>
<td>5.62*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>843</td>
<td>87</td>
<td>9.69</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.11</td>
<td>45.63</td>
<td></td>
<td>2.48*</td>
<td>2.05</td>
</tr>
<tr>
<td>48.11</td>
<td></td>
<td>47.11</td>
<td>1.00</td>
<td>1.73</td>
</tr>
<tr>
<td></td>
<td>45.63</td>
<td>47.11</td>
<td>1.48*</td>
<td>2.19</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 48.11, 45.63 and 47.11 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 2.48, 1.48 and 1.00 respectively. The confidence interval values of Basketball and Football players, Basketball and Volleyball and Volleyball players and Football players are 2.05, 2.19 and 1.73 respectively. Hence there is significant difference between Basketball and Volleyball players and Basketball and Football players. However the difference between Football and Volleyball players is found insignificant.

The mean values of lean body weight among university men Football, Basketball and Volleyball players are presented in figure-XXII.
FIGURE XXII: THE MEAN VALUES OF LEAN BODY WEIGHT AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.22. DISCUSSION ON THE FINDINGS OF LEAN BODY WEIGHT

The one way analysis of variance indicated that there was significant difference in lean body weight of university men Football, Basketball and Volleyball players. Since these players require a particular structure shape of body for a specific game, the lean body weight of the players of these players differ from each other. These findings are in agreement with the findings of Bloomfield, et al.\textsuperscript{21}.

TABLE XXIV
ONE WAY ANALYSIS OF VARIANCE OF ANAEROBIC POWER AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in watts (kg-m/sec))

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>27100.08</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>4301.44</td>
<td>2</td>
<td>2153.12</td>
<td>8.22*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>22798.64</td>
<td>87</td>
<td>262.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XXIV shows the one way analysis of variance of anaerobic power of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 8.22 is greater than the table F ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XXIV-A shows the Scheffe's Post-hoc test of anaerobic power of university men Football, Basketball and Volleyball players.

TABLE XXIV-A
ORDERED SCHEFFE'S POST-HOC TEST FOR ANAEROBIC POWER MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in watts (kg-m/sec))

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>105.91</td>
<td>120.36</td>
<td></td>
<td>14.45*</td>
<td>9.39</td>
</tr>
<tr>
<td>105.91</td>
<td></td>
<td>106.18</td>
<td>0.27</td>
<td>11.88</td>
</tr>
<tr>
<td></td>
<td>120.36</td>
<td>106.18</td>
<td>14.18*</td>
<td>11.11</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 105.91, 120.36 and 106.18 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and volleyball and Football players are 14.45, 14.18 and 0.27 respectively. The confidence interval values of Basketball and Football players, Basketball and Volleyball players and Volleyball and Football players are 9.39, 11.11 and 11.88 respectively. Hence, there is significant difference between Basketball and Football and Basketball and Volleyball players. However the difference between Volleyball players and Football players is found insignificant.

The mean values of anaerobic power among university men Football, Basketball and Volleyball players are presented in figure-XXIII.
FIGURE XXIII: THE MEAN VALUES OF ANAEROBIC POWER AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.23. DISCUSSION ON THE FINDINGS OF ANAEROBIC POWER

The one way analysis of variance of anaerobic power showed that there was significant difference in anaerobic power of the university men Football, Basketball and Volleyball players. It may be due to the nature of the training.

Anaerobic power is high intensity exercise of short duration, that does not depend on the body's ability to supply oxygen. Anaerobic power is generally characterised by strong contraction from activities that requires energy at such rates from break down of ATP, CP and Glycolysis systems that aerobic metabolism can not possibly provide. The different duration of aerobic game training would have increased the possibility of a break down of ATP, CP and Glycolysis systems. The increased capacity of ATP and CP is due to the increased storage of both ATP and CP, that is found in the muscles following the different duration of aerobic games practices. Also there was an increase in the level of enzyme activity in the ATP and CP systems. This enzyme is called as creatinekinese and it is responsible for the oxidation of CP when it is broken down, release energy for resynthesis of ATP.

Further, the nature of the training of the Football, Basketball and Volleyball players would have increased glycolytic enzymes called phosphofructokinase, which enhances the anaerobic power. The findings of the study were supported by Gallahne22.

Table XXV shows the one way analysis of variance of resting pulse rate of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 27.25 is greater than the table F-ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence, the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XXV-A shows the Scheffe's Post-hoc test of resting pulse rate of university men Football, Basketball and Volleyball players.

### TABLE XXV

**ONE WAY ANALYSIS OF VARIANCE OF RESTING PULSE RATE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS**

(Scores in per minutes)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1064</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>409.8</td>
<td>2</td>
<td>204.90</td>
<td>27.25*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>654.2</td>
<td>87</td>
<td>7.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
* Significant at 0.05 level

### TABLE XXV-A

**ORDERED SCHEFFE'S POST-HOC TEST FOR RESTING PULSE RATE MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS**

(Scores in per minute)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>65.19</td>
<td>63.27</td>
<td></td>
<td>1.92*</td>
<td>1.67</td>
</tr>
<tr>
<td>65.19</td>
<td></td>
<td>69.00</td>
<td>3.81*</td>
<td>1.94</td>
</tr>
<tr>
<td></td>
<td>63.27</td>
<td>69.00</td>
<td>6.73*</td>
<td>1.94</td>
</tr>
</tbody>
</table>
* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 65.19, 63.27 and 69.00 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.92, 6.73 and 3.81 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 1.67, 1.94 and 1.94 respectively. Hence, there is significant difference between Basketball and Volleyball players; Basketball and Football players and Football and Volleyball players.

The mean values of resting pulse rate among university men Football, Basketball and Volleyball players are presented in figure-XXIV.
FIGURE XXIV: THE MEAN VALUES OF RESTING PULSE RATE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.24. DISCUSSION ON THE FINDINGS OF RESTING PULSE RATE

The findings of the resting pulse rate of university men Football, Basketball and Volleyball players were significant at 0.5 level of confidence for the degrees of freedom 2 and 87. It may be due to the nature of the training and duration of training.

It was due to the fact that training increased the size of the heart stroke volume and cardio output, the greater efficiency of the heart allows a large blood flow to reach the muscles with less stress impress on the heart. The decreased pulse rate at rest is a consequence of aerobic training. The cause of resting brady cardio is related to the effects of training on the autonomic nervous system that are particularly reflected in the vagues nerves to the heart. Training may either increase parasympathetic inhibition of pulse rate or decrease sympathetic stimulation or effect both. The present research findings indicate that the resting pulse rate decreased due to the nature of training and duration of training. The findings of the study is supported by Berger23.

TABLE XXVI
ONE WAY ANALYSIS OF VARIANCE OF CARDIORESPIRATORY ENDURANCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in metres)

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>OF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2961580</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>314615</td>
<td>2</td>
<td>157307.50</td>
<td>5.17*</td>
<td>3.109</td>
</tr>
<tr>
<td>Within</td>
<td>2646965</td>
<td>87</td>
<td>30424.89</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

Table XXVI shows the one way analysis of variance of cardiorespiratory endurance of university men Football, Basketball and Volleyball players. Since the obtained F-ratio 5.17 is greater than the table F ratio 3.109, the study is significant at 0.05 level of confidence for the degrees of freedom 2 and 87. Hence the Scheffe's post-hoc test was used to analyse the paired mean significant difference.

Table XXVI-A shows the Scheffe's Post-hoc test of cardiorespiratory endurance of university men Football, Basketball and Volleyball players.

TABLE XXVI-A
ORDERED SCHEFFE'S POST-HOC TEST FOR CARDIORESPIRATORY ENDURANCE MEANS AND DIFFERENCE BETWEEN MEANS OF UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
(Scores in metres)

<table>
<thead>
<tr>
<th>Football players</th>
<th>Basketball players</th>
<th>Volleyball players</th>
<th>M.D.</th>
<th>C.I.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3976.60</td>
<td>4023.60</td>
<td>47.00</td>
<td>106.40</td>
<td></td>
</tr>
<tr>
<td>3976.60</td>
<td>3865.50</td>
<td>111.10</td>
<td>122.86</td>
<td></td>
</tr>
<tr>
<td>4023.60</td>
<td>3865.50</td>
<td>158.10*</td>
<td>122.86</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
From this table, it is clear that the mean values of Football, Basketball and Volleyball players are 3976.6, 4023.6 and 3865.5 respectively. The mean differences between the Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 47.00, 158.1 and 111.1 respectively. The confidence interval values of Basketball and Football players; Basketball and Volleyball players and Volleyball and Football players are 106.4, 122.86 and 122.86 respectively. Hence, there is significant difference between Basketball and Volleyball players. However, the difference between Basketball and Football players, Football and Volleyball players are found insignificant.

The mean values of cardiorespiratory endurance among university men Football, Basketball and Volleyball players are presented in figure-XV.
FIGURE XXV: THE MEAN VALUES OF CARDIORESPIRATORY ENDURANCE AMONG UNIVERSITY MEN FOOTBALL, BASKETBALL AND VOLLEYBALL PLAYERS
4.3.25. DISCUSSION ON THE FINDINGS OF CARDIO-RESPIRATORY ENDURANCE

The findings of the cardiorespiratory endurance showed that there was significant difference among the university men Football, Basketball and Volleyball players. It may be due to the nature of training and duration of training.

Cardiorespiratory endurance is the ability to sustain physical exercise and to recover from vigorous physical activity in a reasonable time with no lasting side effects. Due to aerobic training, cardiac output increases to approximately four times of that experienced during rest in the normal individual and may increase as much as six times in elite endurance athletes.

As a result of aerobic training, the pulmonary function is improved in the trained individual related to the untrained individual.

Further, the nature of the training and duration of the training of the above groups are different which would have influenced the following factors:

i. Decreased resting heart rate
ii. Increased stroke volume
iii. Decrease in recovery time
iv. Increased capillarization
v. Increased functional capacity in the lungs
vi. Increased muscle glycogen used.

Hence there was significant difference in cardiorespiratory endurance among the three groups. This is supported by Prentice.²⁴

4.4. DISCUSSION ON HYPOTHESIS

In this research, it was hypothesised that there would be significant difference in selected body composition, anthropometric and physiological variables among university men Football, Basketball and Volleyball players.

The finding of the study showed that there were significant differences in body weight, height, sitting height, lower limb length, upper limb length, relaxed arm circumference, flexed arm circumference, calf circumference, ponderal index, skelic index, mesomorphy, ectomorphy, percent fat, absolute fat, lean body weight, anaerobic power, resting pulse rate and cardiorespiratory endurance among university men Football, Basketball and Volleyball players. Hence the hypothesis was accepted on the above said variables.

Further, the finding of the study showed that there were no significant differences in age, humerus width, femur width, chest circumference, abdominal circumference, sum of six skinfolds and endomorphy among the university men Football, Basketball and Volleyball players. Hence the hypothesis was rejected on the above said variables.