Chapter IV

ANALYSIS OF DATA AND RESULT OF THE STUDY

The analysis of data, findings and the discussions of the findings have been presented in this chapter. The data collected on Lean, Average and Obese subjects (N=150) were examined by applying analysis of variance (F-ratio) on their physical, physiological and psychological aspects. To find out the significance of differences between paired means on the same variables, the Scheffe's Post-Hoc Test was applied where F-ratio was found significant.

Findings

The findings pertaining to Physical Fitness, Cardio-pulmonary Index and Eysenck's Personality Inventory for all the three groups have been given below.

Physical Fitness

Table 2 shows the analysis of variance of the three study groups in physical fitness and the means of these groups have been exhibited in Figure 5.
TABLE 2

ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE
AND OBESE GROUPS IN PHYSICAL FITNESS:

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>1975173.89</td>
<td>987586.9</td>
<td>99.49*</td>
</tr>
<tr>
<td>With Groups</td>
<td>147</td>
<td>1459136.65</td>
<td>9926.09</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at .05 Level of Confidence

\[ F_{.05}(2, 147) = 3.06 \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 99.49 was very high as compared to the F-value of 3.06.

As the F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post-hoc test is given in Table 3.
Fig. 5. Differences Between Measures for Lean, Average and Obese Groups in Physical Fitness.

- L = Lean Group
- A = Average Group
- O = Obese Group

Scale:
3 cms. = 100 Scores
TABLE 3
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE
LEAN, AVERAGE AND OBESE GROUPS IN
PHYSICAL FITNESS

<table>
<thead>
<tr>
<th>GROUPS</th>
<th></th>
<th></th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean 366.43</td>
<td>378.91</td>
<td></td>
<td>12.48</td>
</tr>
<tr>
<td>Average 366.43</td>
<td>174.84</td>
<td></td>
<td>191.59*</td>
</tr>
<tr>
<td>Obese 378.91</td>
<td>174.84</td>
<td></td>
<td>204.07*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 49.38

It was evident from the above table that the difference between paired means for the Lean and Average groups (12.48) was not found to be significant, whereas the differences between paired means for the Lean and Obese groups (191.59), and Average and Obese groups (204.07) were found to be significant, as the confidence interval of 49.38 was less than these values. This indicated that the Lean and Average groups did not differ significantly, whereas the Lean and Obese groups and the Average and Obese groups showed significant differences on the physical fitness scores.
Pull-ups

Table 4 shows the analysis of variance of the three study groups in Pull-ups, and the means of these groups have been exhibited in Fig. 6).

**TABLE 4**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN PULL-UPS**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>298.36</td>
<td>149.18</td>
<td>25.89*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>147</td>
<td>847.14</td>
<td>5.76</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{.05} (2,147) = 3.06 \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 25.89 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post-Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post-hoc test is given in Table 5.
Fig. 6. Differences Between Means for Lean, Average and Obese Groups in Pull-ups.

L = Lean Group

A = Average Group

O = Obese Group
TABLE 5
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE
LEAN, AVERAGE AND OBESE GROUPS IN
PULL-UPS

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6</td>
<td>3.96</td>
<td>1.34</td>
<td></td>
<td>0.64</td>
</tr>
<tr>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td>3.26*</td>
</tr>
<tr>
<td>3.96</td>
<td></td>
<td>1.34</td>
<td></td>
<td>2.62*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 1.185.

It is evident from the Table 5 that the difference between paired means for the Lean and Average groups (0.64) was not found to be significant, where as the differences between paired means for the Lean and Obese groups (3.26), and Average and Obese groups (2.62), were found to be significant, as the confidence interval of 1.185 was less than these values. This indicated that the Lean and Average groups did not differ from each other significantly, but Lean and Obese groups and the Average and Obese groups showed significant differences from each other on the scores of pull-ups.
Sit-ups

Table 6 shows the analysis of variance of the three study groups in Sit-ups, and the means of these groups have been exhibited in Fig. 7.

**TABLE 6**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN SIT-UPS.**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>1938.54</td>
<td>969.27</td>
<td>22.71*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>6273.52</td>
<td>42.67</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{0.05} (2, 147) = 3.06 \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 22.71 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant, the Scheffe's Post-Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 7.
Scale:
2 cms. = 5 Numbers

Fig. 7. Differences Between Means for Lean, Average and Obese Groups in Sit-ups.

L = Lean Group.
A = Average Group.
O = Obese Group.
<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24.48</td>
<td>27.92</td>
<td></td>
<td>3.44*</td>
</tr>
<tr>
<td></td>
<td>24.48</td>
<td></td>
<td>19.18</td>
<td>5.30*</td>
</tr>
<tr>
<td></td>
<td>27.92</td>
<td></td>
<td>19.18</td>
<td>8.74*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 3.225.

It is evident from Table 7 that the differences between paired means for the Lean and Average groups (3.44), Lean and Obese groups (5.30), and Average and Obese groups (8.74) were found to be significant, as the confidence interval of 3.225 was less than these values. This indicated that all the three groups differed significantly from each other on the scores of Sit-ups.
Standing Broad Jump

Table 8 shows the analysis of variance of the three study groups in Standing Broad Jump and the means of the groups have been exhibited in Fig. 8.

**TABLE 8**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN STANDING BROAD JUMP**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>6282.28</td>
<td>3141.14</td>
<td>46.54*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>147</td>
<td>9919.72</td>
<td>67.48</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{0.05} (2,147) = 3.06 \]

It is evident from the above table that there were significant differences among all the three study groups as the obtained F-ratio of 46.54 was more than the F-ratio of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance differences between the paired means. The analysis pertaining to post hoc test is given in Table 9.
Fig. 8. Differences Between Means for Lean, Average and Obese Groups in Standing Broad Jump.

L = Lean Group.
A = Average Group.
O = Obese Group.
TABLE 9
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN STANDING BROAD JUMP

<table>
<thead>
<tr>
<th>GROUPS</th>
<th></th>
<th></th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean</td>
<td>Average</td>
<td>Obese</td>
<td></td>
</tr>
<tr>
<td>79.76</td>
<td>80.58</td>
<td></td>
<td>0.82</td>
</tr>
<tr>
<td>79.76</td>
<td>66.46</td>
<td></td>
<td>13.30*</td>
</tr>
<tr>
<td>80.58</td>
<td>66.46</td>
<td></td>
<td>14.20*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 4.05.

It is evident from Table 9 that the difference between paired means for the Lean and Average groups (0.82), was not found to be significant, whereas the differences between paired means for the Lean and Obese groups (13.30), and for the Average and Obese groups (14.20), were found to be significant, as the confidence interval of 4.05 was less than these values.

This indicated that the Lean and Average groups did not differ from each other significantly, whereas the Lean and Obese groups and the Average and Obese groups showed significant differences from each other on the scores of Standing Broad Jump.
Shuttle Run

Table 10 shows the analysis of variance of the three study groups in Shuttle Run and the means of these groups have been exhibited in Fig. 9.

**TABLE 10**

ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN SHUTTLE RUN

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>40.72</td>
<td>20.36</td>
<td>36.35*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>74.44</td>
<td>.506</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{0.05} (2, 147) = 3.06. \]

It is evident from the above table that there were significant differences among all the three study groups as the obtained F-ratio of 36.35 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant, the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 11.
Fig. 9. Differences Between Means for Lean, Average and Obese Groups in Shuttle Run.

L = Lean Group.
A = Average Group.
O = Obese Group.

Scale:
2 cm. = 2 Seconds
TABLE 11
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE
LEAN, AVERAGE AND OBSESE GROUPS IN
SHUTTLE RUN

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.382</td>
<td>10.170</td>
<td></td>
<td>0.212</td>
</tr>
<tr>
<td></td>
<td>10.382</td>
<td></td>
<td>11.266</td>
<td>0.884*</td>
</tr>
<tr>
<td></td>
<td>10.170</td>
<td></td>
<td>11.266</td>
<td>1.096*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 0.351.

It is evident from Table 11 that the difference between paired means for the Lean and Average groups (0.212), was not found to be significant, whereas the differences between paired means for the Lean and Obese groups (0.884), and Average and Obese groups (1.096), were found to be significant, as the confidence interval of 0.351 was less than these values.

This indicated that the Lean and Average groups did not differ from each other significantly, but the Lean and Obese groups and the Average and Obese groups showed significant differences from each other on the scores of Shuttle Run.
12 Minutes Run/Walk

Table 12 shows the analysis of variance of the three study groups in 12 Minutes Run/Walk and the means of these groups have been exhibited in Fig. 10.

TABLE 12
ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN TWELVE MINUTES RUN/WALK

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>3.033</td>
<td>1.516</td>
<td>52.27*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>4.290</td>
<td>0.290</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{.05} (2,147) = 3.06. \]

It is evident from the above table that there were significant differences among all the three study groups as the obtained $F$-ratio of 52.27 was more than the $F$-value of 3.06.

As the obtained $F$-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 13.
Scale:

3 cms. = 0.50 miles.

Fig. 10. Differences Between Means for Lean, Average and Obese Groups in 12 Minutes Run/Walk.

L = Lean Group.
A = Average Group.
O = Obese Group.
TABLE 13
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN TWELVE MINUTES RUN/WALK

<table>
<thead>
<tr>
<th>Groups</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.39</td>
<td>1.33</td>
<td></td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>1.39</td>
<td></td>
<td>1.06</td>
<td>0.27*</td>
</tr>
<tr>
<td></td>
<td>1.33</td>
<td></td>
<td>1.06</td>
<td>0.33*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 0.084.

It is evident from Table 13 that the difference between paired means for the Lean and Average groups (0.06), was not found to be significant, whereas the differences between paired means for the Lean and Obese groups (0.27) and for the Average and Obese groups (0.33), were found to be significant as the confidence interval of 0.084 was less than these values.

This indicated that the Lean and Average groups did not differ from each other significantly, whereas the Lean and Obese groups and the Average and Obese groups showed significant differences from each other on the scores of Twelve Minutes Run/Walk.
50 Yards Dash

Table 14 shows the analysis of variance of the three study groups in 50 Yards Dash and the means of these groups have been exhibited in Fig. 11.

**TABLE 14**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN 50 YARDS DASH**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>18.73</td>
<td>9.36</td>
<td>24.76*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>55.68</td>
<td>0.378</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.

\[ F_{0.05} (2, 147) = 3.06. \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 24.76 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 15.
Fig. 11. Differences Between Means for Lean, Average and Obese Groups in 50 Yards Dash.

L = Lean Group.

A = Average Group.

O = Obese Group.

Scale:

2.4 cms. = 2 seconds
TABLE 15
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN 50 YARDS DASH.

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.158</td>
<td>7.776</td>
<td>0.618*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.942</td>
<td>7.776</td>
<td>0.834*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence. Confidence Interval = 0.303.

It is evident from Table 15 that the difference between paired means for the Lean and Average groups (0.216), was not found to be significant, whereas the differences between paired means for the Lean and Obese groups (0.618), and Average and Obese groups (0.834), were found to be significant as the confidence interval of 0.303 was less than these values.

This indicated that the Lean and Average groups did not differ from each other significantly, whereas the Lean and Obese groups and the Average and Obese groups showed significant differences from each other on the scores of 50 Yards Dash.
Findings of Physical Fitness (AAHPER TEST)

The result of the study indicated that in total Physical Fitness, Lean and Average groups did not differ significantly, however, significant differences were observed between Lean and Obese groups and between Average and Obese groups. Average and Lean groups performed significantly better than the obese group.

While considering the differences among each group on each items of AAHPER test separately, it was found that the average group performed significantly better than the Obese group on the Physical Fitness items of Sit-ups, 50 Yards Dash, Pull-ups, Shuttle Run, Standing Broad Jump, and 12 Minutes Run/Walk. The Lean group also performed significantly better than the obese group on the above said items. The Average and Lean groups did not differ significantly from each other on the above mentioned items except for Sit-ups.

Considering the paired means differences between Average and Lean groups, the Average group was superior in Sit-ups, 50 Yards Dash, Shuttle Run and Standing Broad Jump; whereas Lean group was superior in Pull-ups and 12 Minutes Run/Walk.
Discussion of Findings

It was obvious from the findings that the obesity contributed negatively towards the performance on items of physical fitness and this supports the notion that people with extra amount of fat on the body have low fitness status on the items of physical fitness. The reasons for this may be that, due to the extra amount of fat the relative lean body mass goes down and thereby performance levels also deteriorates. Secondly, the extra amount of fat acts as the dead weight, which the individual has to overcome while performing the items. The reasons of accumulation of fat may be the passive way of living and/or wrong dietary habits, whereas those who live an active life and involve themselves in Physical activity shed extra fat from the body and also such involvement help in hypertrophy of various muscles, which subsequently help in scoring high on physical fitness items. The similar trend has also been observed by Cureton, Baileau and Lohman\(^1\), John\(^2\), Cureton et. al.\(^3\)

\(^1\) Cureton, Baileau and Lohman, Research Quarterly 46 (May 1975): 218.


\(^3\) Cureton et. al., Research Quarterly 48 (May 1977): 270.
The difference between both non-obese groups i.e. Lean group and Average group in certain items may be due to the fact that these groups may have differences between themselves in terms of muscle mass, amount of fat and nutritional status. The subjects in the Average group showing superiority in some of the items may be due to the fact that they might have better muscle power due to the size, which enables them to perform better and due to the structural deficiency because of malnutrition etc. the Lean group might not have performed better. In the items, where Lean group had shown superiority as compared to the Average group may be due to the fact that they have to overcome less amount of fat while performing those items. Therefore, the Hypothesis with respect to the physical fitness characteristics stated in the study was accepted.

Physiological Variables

Table 16 shows the analysis of variance of the three study groups in Cardio-Pulmonary Index, which is a measure of physical efficiency and the means of these groups have been exhibited in Fig. 12.
TABLE 16

ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBSESE GROUPS IN CARDIO-PULMONARY INDEX

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>0.662</td>
<td>0.331</td>
<td>16.55*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>147</td>
<td>2.975</td>
<td>0.020</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{.05}(2, 147) = 3.06. \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 16.55 was more than the F-value of 3.06.

As the F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 17.
Fig. 12. Differences Between Means for Lean, Average and Obese Groups in Cardio-pulmonary Index.

L = Lean Group.
A = Average Group.
O = Obese Group.
TABLE 17

PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN CARDIO-PULMONARY INDEX

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.752</td>
<td>0.829</td>
<td></td>
<td>0.077*</td>
</tr>
<tr>
<td></td>
<td>0.752</td>
<td></td>
<td>0.667</td>
<td>0.085*</td>
</tr>
<tr>
<td></td>
<td>0.829</td>
<td>0.667</td>
<td></td>
<td>0.162*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence. Confidence Interval 0.069.

It is evident from Table 17 that the differences between paired means for the Lean and Average groups (0.077), Lean and Obese Groups (0.085), and between Average and Obese groups (0.162) were found to be significant as the Confidence Interval of 0.069 was less than these values.

This indicated that all the three groups differed significantly from each other on the scores of Cardio-pulmonary Index.
Pulse Rate

Table 18 shows the analysis of variance of the three study groups in Pulse-rate and the means of these groups have been exhibited in Fig. 13.

TABLE 18

ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN PULSE-RATE

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>2296.96</td>
<td>114.48</td>
<td>20.43*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>8423.04</td>
<td>57.299</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{0.05} (2,147) = 3.06. \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 20.43 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 19.
Fig. 13. Differences Between Means for Lean, Average and Obese Groups in Pulse-rate.

L = Lean Group.
A = Average Group.
O = Obese Group.
TABLE 19
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN PULSE-RATE

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean</td>
<td>Average</td>
</tr>
<tr>
<td>75.76</td>
<td>74.00</td>
</tr>
<tr>
<td>75.76</td>
<td></td>
</tr>
<tr>
<td>74.00</td>
<td>83.04</td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.
Confidence Interval 3.739.

It is evident from Table 19 that the difference between paired means for the Lean and Average groups (1.76), was not found to be significant, where as the differences between paired means for the Lean and Obese groups (7.28), and Average and Obese groups (9.04) were found to be significant as the Confidence Interval of 3.739 was less than these values.

This indicated that the Lean and Average group did not differ significantly, where as the Lean and Obese groups showed significant differences on the scores of Pulse-rate.
Maximum Expiratory Pressure

Table 20 shows the analysis of variance of the three study groups in Maximum Expiratory Pressure and the means of these groups have been exhibited in Fig. 14.

**TABLE 20**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN MAXIMUM EXPIRATORY PRESSURE**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>5406.1</td>
<td>2703.05</td>
<td>1.811</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>129311.6</td>
<td>1491.915</td>
<td></td>
</tr>
</tbody>
</table>

\[ F_{0.05}(2,147) = 3.06 \]

It is evident from the above table that there were no significant differences among the three study groups as the obtained F-ratio of 1.811 was less than the F-value of 3.06.

As the F-ratio was not found to be significant, the post hoc test was not applied.
Fig. 14. Differences Between Means for Lean, Average and Obese Groups in Maximum Expiratory Pressure.

L = Lean Group.
A = Average Group.
O = Obese Group.
Breath Holding Time

Table 21 shows the analysis of variance of the three study groups in Breath Holding Time and the means of these groups have been exhibited in Fig. 15.

**TABLE 21**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN BREATH HOLDING TIME**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>2</td>
<td>4454.50</td>
<td>2227.250</td>
<td>8.036*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>40737.78</td>
<td>277.127</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.

\[ F_{.05} (2, 147) = 3.06. \]

It is evident from the above Table that there were significant differences among the three study groups as the obtained F-ratio of 8.036 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 22.
Fig. 15. Differences Between Means for Lean, Average and Obese Groups in Breath Holding Time.

L = Lean Group.
A = Average Group.
O = Obese Group.

Scale:
3 cms. = 20 Seconds.
<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60.92</td>
<td>67.18</td>
<td>6.26</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60.92</td>
<td>53.84</td>
<td>7.08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>67.18</td>
<td>53.84</td>
<td>13.34*</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.

Confidence Interval = 8.223.

It is evident from Table 22 that the differences between paired means for the Lean and Average groups (6.26), and Lean and Obese groups (7.08) were not found to be significant, whereas the difference between paired means for the Average and Obese groups (13.34) was found to be significant, as the Confidence Interval of 8.223 was less than this value.

This indicated that the Lean and Average groups and the Lean and Obese groups did not differ significantly, whereas the Average and Obese groups showed significant differences on the scores of Breath Holding Time.
Diastolic Blood Pressure

Table 23 shows the analysis of variance of the three study groups in Diastolic Blood Pressure and the means of these groups have been exhibited in Fig. 16.

**TABLE 23**

**ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN DIASTOLIC BLOOD PRESSURE**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>965.48</td>
<td>482.73</td>
<td>12.328*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>5755.88</td>
<td>39.115</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{0.05} (2,147) = 3.06. \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 12.328 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 24.
Scale:
3 cms. = 20 mm. Hg.

Fig. 16. Differences Between Means of Lean, Average and Obese Groups in Diastolic Blood Pressure.

L = Lean Group.
A = Average Group.
O = Obese Group.
TABLE 24.
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE
LEAN, AVERAGE AND OBESE GROUPS IN
DIASTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>71.22</td>
<td>71.06</td>
<td>76.52</td>
<td>5.30*</td>
</tr>
<tr>
<td></td>
<td>71.06</td>
<td>76.52</td>
<td></td>
<td>5.46*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.
Confidence Interval = 3.091

It is evident from Table 24 that the difference between paired means for the Lean and Average groups (0.16), was not found to be significant, whereas the differences between paired means for the Lean and Obese groups (5.30), and Average and Obese groups (5.46) were found to be significant as the confidence interval of 3.091 was less than these values.

This indicated that the Lean and Average groups did not differ significantly, whereas the Lean and Obese groups and the Average and Obese groups showed significant differences on the scores of Diastolic Blood Pressure.
Systolic Blood Pressure

Table 25 shows the analysis of variance of the three study groups in Systolic Blood Pressure and the means of these groups have been exhibited in Fig.17.

**TABLE 25**

ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN SYSTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>4419.68</td>
<td>2209.84</td>
<td>36.015*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>9019.76</td>
<td>61.358</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.

\[ F_{.05} (2,147) = 3.06 \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 36.015 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 26.
TABLE 17
PAIRS: MEANS AND DIFFERENCES BETWEEN
LEAN, AVERAGE AND OBESE GROUPS IN
SYSTOLIC BLOOD PRESSURE

Scale:
2 cms. = 25 mm. Hg.

Fig. 17. Differences Between Means for Lean, Average
and Obese Groups in Systolic Blood Pressure.

L = Lean Group.
A = Average Group.
O = Obese Group.
### TABLE 26
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN SYSTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean</td>
<td>Average</td>
</tr>
<tr>
<td>116.48</td>
<td>114.88</td>
</tr>
<tr>
<td>116.48</td>
<td></td>
</tr>
<tr>
<td>114.88</td>
<td>126.2</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.
Confidence Interval = 3.869.

It is evident from Table 26 that the difference between paired means for the Lean and Average groups (1.6), was not found to be significant whereas the differences between paired means for the Lean and Obese groups (9.72), and Average and Obese groups (11.32) were found to be significant as the Confidence Interval of 3.869 was less than these values.

This indicated that the Lean and Average groups did not differ significantly, whereas the Lean and Obese groups and the Average and Obese groups showed significant differences on the scores of Systolic Blood Pressure.
Vital Capacity

Table 27 shows the analysis of variance of the three study groups in Vital Capacity and the means of these groups have been exhibited in Fig. 18.

TABLE 27
ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN VITAL CAPACITY

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>2.1</td>
<td>1.05</td>
<td>5.86*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>26.399</td>
<td>0.179</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence

\[ F_{.05}(2, 147) = 3.06 \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 5.86 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired means. The analysis pertaining to post hoc test is given in Table 28.
Scale:

2 cms. = 0.50 Liters.

Fig. 18. Differences Between Means for Lean, Average and Obese Groups in Vital Capacity.

L = Lean Group.
A = Average Group.
O = Obese Group.
TABLE 28
PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE
LEAN, AVERAGE AND OBESE GROUPS IN
VITAL CAPACITY

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.466</td>
<td>2.750</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.466</td>
<td></td>
<td>2.558</td>
<td>0.092</td>
</tr>
<tr>
<td></td>
<td>2.750</td>
<td></td>
<td>2.558</td>
<td>0.192</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence.
Confidence Interval = 0.209

It is evident from Table 28 that the difference between paired means for the Lean and Average groups (0.284) was found to be significant as the Confidence Interval of 0.209 was less than this value, whereas the differences between paired means for the Lean and Obese groups (0.092) and Average and Obese groups (0.192) were not found to be significant.

This indicated that the Lean and Average groups differed significantly whereas the Lean and Obese groups and the Average and Obese groups did not show any significant differences on the scores of Vital Capacity.
Findings of Physiological Variables (C.P. Index)

The result of the study indicated that in the Cardio-vascular efficiency based on C.P. Index (Adynamic), significant differences existed among all the three study groups. Where Average group was significantly better than Lean and Obese group, the Lean group proved to be superior as compared to the obese group.

While considering the differences among all the groups on each variable separately, it was indicated that the average group was significantly better than the Lean and Obese group on the Cardio-pulmonary fitness variables of Pulse Rate, Blood Pressure, Vital Capacity and Breath Holding Time. The Lean group also showed significantly better Cardio-pulmonary fitness than the Obese group in Pulse Rate and Blood Pressure. The Average and Lean groups differ significantly on all the items of C.P. Index, except for Vital Capacity and Breath Holding Time. All the three groups did not show any significant difference on one of the C.P. Index Items, that is Maximum Expiratory Pressure.

Considering the paired mean differences between the Average and Lean group, the Average group was superior in all the items of C.P. Index.
Discussions of Findings

The C.P. Index (Adynamic), indicates Cardio-vascular efficiency of an individual in pre-exercise condition. In fat Cardio-vascular efficiency of an individual which is evaluated by C.P. Index, is a cumulative effect of various physiological variables, such as Pulse rate, Blood pressure, Vital capacity, Maximum Expiratory pressure, and Breath holding time including the age.

It could be observed from the result that the higher percentage of fat contributed negatively to the Cardio-pulmonary efficiency, which may be due to the fact that fat puts extra burden on the physiological systems, thereby bringing down the cardio-pulmonary efficiency of obese groups as compared to the Lean and Average groups. It may be due to the increased length of blood vessels and distribution pattern of fat in the body of Obese people as to that of Lean and Average people.

These findings in relation to Cardio-vascular fitness are in conformity with the findings of Whyte, Yoest, and Backer.

---

The possible reasons of having high C.P. Index in Average group than that of the Lean group in this study may be due to the fact that Average Lean Body Mass of Lean group may be significantly lower to that of Average group due to various reasons namely malnutrition and others which lead to structural limitations, Aerobic and Anaerobic deficiency, lack of strength in muscles of respiratory apparatus etc. Therefore, the Hypothesis with regard to physiological characteristics stated in the study was accepted.

Psychological Dimensions

The analysis of data pertaining to psychological dimensions scored on Eysenck's Personality Inventory is given below:

Neuroticism

Table 29 shows the analysis of variance of the three study groups in Neuroticism a psychological dimension and the means of these groups have been exhibited in Fig. 19.
TABLE 29
ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN NEUROTICISM

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>109.7</td>
<td>54.85</td>
<td>0.744</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>10813.8</td>
<td>73.69</td>
<td></td>
</tr>
</tbody>
</table>

\[ F_{0.05} (2, 147) = 3.06 \]

It is evident from the above table that there were no significant differences among all the three study groups as the obtained F-ratio of 0.744 was less than the F-value of 3.06.

As the F-ratio was not found to be significant the Scheffe's Post Hoc Test was not applied.
Scale:
2 cms. = 10 scores.

Fig. 19. Differences Between Means for Lean, Average and Obese Groups in Neuroticism.

L = Lean Group.
A = Average Group.
O = Obese Group.
Extraversion

Table 30 shows the analysis of variance of the three study groups in Extraversion another psychological dimension and the means of these groups have been exhibited in Fig. 20.

**TABLE 30**
ANALYSIS OF VARIANCE OF THE MEANS OF LEAN, AVERAGE AND OBESE GROUPS IN EXTRAVERSION

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>639.52</td>
<td>319.76</td>
<td>4.560*</td>
</tr>
<tr>
<td>Within groups</td>
<td>147</td>
<td>10307.02</td>
<td>70.115</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.

\[ F_{.05}(2,147) = 3.06. \]

It is evident from the above table that there were significant differences among the three study groups as the obtained F-ratio of 4.560 was more than the F-value of 3.06.

As the obtained F-ratio was found to be significant the Scheffe's Post Hoc Test was applied to determine the significance of differences between the paired Means. The analysis pertaining to post hoc test is given in Table 31.
Scale:
2 cms. = 10 Scores.

Fig. 20. Differences Between Means for Lean, Average and Obese Groups in Extraversion.

L = Lean Group.
A = Average Group.
O = Obese Group.
### TABLE 31

**PAIRED MEANS AND DIFFERENCES BETWEEN MEANS FOR THE LEAN, AVERAGE AND OBESE GROUPS IN EXTRAVERSION.**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Lean</th>
<th>Average</th>
<th>Obese</th>
<th>Difference Between Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50.1</td>
<td>54.5</td>
<td></td>
<td>4.4*</td>
</tr>
<tr>
<td></td>
<td>50.1</td>
<td></td>
<td>50.14</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>54.5</td>
<td></td>
<td>50.14</td>
<td>4.36*</td>
</tr>
</tbody>
</table>

*Significant at .05 Level of Confidence
Confidence Interval = 4.136.

It is evident from Table 31 that the difference between paired means for the Lean and Obese group (0.04) was not found to be significant, whereas the differences between paired means for the Lean and Average groups (4.4), and for the Average and Obese group (4.36) were found to be significant as the confidence interval of 4.136 was less than these values.

This indicated that the Lean and Obese groups did not differ from each other significantly, whereas the Lean and Average groups and the Average and Obese groups showed significant differences from each other on the scores of Extraversion.
Findings With Regard to Psychological Dimensions

The result of the study indicated that all the three study groups did not differ significantly on the dimension of neuroticism of the Eysenck's Personality Inventory, where as significant difference was observed between the Lean and Average groups and the Average and Obese groups on the dimension of Extraversion, however, no significant difference was found between Lean and Obese groups.

Discussions of Findings

The insignificant difference among all the three groups on the dimension of neuroticism may be due to the fact that the complexity of modern city life have resulted in more stability in terms of emotions in all the groups, since all the individuals are required to check their emotions at every step which they take. Galder⁷, also did not find any observable pattern between any of the personality factors in his study groups.

The result also indicated that the Average group is an extrovert group as compared to Lean and Obese groups.

which may be due to the fact that Lean and Obese individuals may not be mixing with the people due to their unimpressive body structure because of the malnutrition and excess body fat respectively. Similar trend has also been observed by Slaughter. Therefore, the Hypothesis with respect to personality characteristics stated in the study was partially accepted.

Implications of Findings in Training

It is evident from the findings of the study that the Lean and Average groups were found significantly better than the Obese group on the physical fitness test items and cardio-pulmonary index. In C.P. Index the Average group performed even better than the Lean group. In any case, these findings support the idea that body composition in terms of fat content, is a factor to be considered while selecting individuals for different games and sports. This point however, can be considered from another angle also, that is perhaps some kind of physical activity may help to achieve adequate body proportionality which will serve as a positive factor in life in general and in sports in particular. This highlights the significance of regular physical exercises for every individuals.

While framing the curriculum for physical education in schools and colleges, Obese group should be treated as a special group and therefore, such activities be prescribed which will take into consideration the special needs of this group, and the Lean and Average groups should be given separate specific programme for further improvement in their abilities.

The findings have further indicated that the Average group was more extrovert than the Lean and Obese groups. Therefore, while selecting the individuals for training for sports and for developing programme of physical education for student population this factor should also be given due consideration. Specially in training it has a special implication to the coach who has to guide and counsel the sportsman from time to time and get the best out of him.

It becomes quite difficult to deal with an introvert than an extrovert because the feeling, emotions and problems of an extrovert can be overtly judged and realised by the coach and the coach can react accordingly, but such is not the case with an introvert.