Chapter IV

ANALYSIS OF DATA AND RESULTS OF THE STUDY

The analysis of data of physical fitness (AAHPER Youth Fitness Test), anthropometric variables (weight, standing height, calf girth, thigh girth, chest girth, upper arm girth, biceps skinfold measurement, triceps skinfold measurement, supra iliac skinfold measurement, sub-scapular skinfold measurement), physiological variables (resting heart rate, working heart rate, resting systolic blood pressure, resting diastolic blood pressure) among two experimental groups (circuit training and aerobic fitness group) and one control group was computed by applying the analysis of co-variance statistics (‘F’ ratio) to find out the existence of significant difference, if any in aforesaid variables among two experimental and control group in pre, post and adjusted post test phases of secondary school girls.

In case of significant difference was observed, the post hoc test was computed to find out the existence of significant difference, if any, of
paired adjusted final means. The level of significance was set at 0.05 level of confidence.

**Findings**

**Physical Fitness**

The statistical analysis of data of physical fitness among circuit training, aerobic fitness and control group of secondary school girls was computed using analysis of co-variance statistics. The data pertaining to this have been presented in Table 7. The same is also graphically presented in Figure 1.
<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>279.76</td>
<td>279.36</td>
<td>278.06</td>
<td>A</td>
<td>47.20</td>
<td>2</td>
<td>23.70</td>
</tr>
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<td></td>
<td>W</td>
<td>2256.20</td>
<td>87</td>
<td>25.93</td>
</tr>
<tr>
<td>Post-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>299.66</td>
<td>281.53</td>
<td>260</td>
<td>A</td>
<td>22613.68</td>
<td>2</td>
<td>11306.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>137355.6</td>
<td>87</td>
<td>1578.80</td>
</tr>
<tr>
<td>Adjusted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>299.22</td>
<td>281.34</td>
<td>261.49</td>
<td>A</td>
<td>20968.44</td>
<td>2</td>
<td>10484.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>136469.33</td>
<td>86</td>
<td>1586.86</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 1. COMPARISON OF PHYSICAL FITNESS AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
The Table 7 and Figure 1 clearly indicate no significant difference in physical fitness among circuit training, aerobic fitness and control group subjects in pre-test phase. Such insignificant difference indicates that the random assignment of the groups were quite successful. However, the ‘F’ ratio values of the post and adjusted post-test phases reveal significant difference in physical fitness among circuit training, aerobic fitness and control group subjects. The ‘F’ values in post and adjusted post-test phases (\(F=7.16\) and 6.607 respectively) are found to be greater than that of required ‘F’ ratio value 3.10 to be significant at 0.05 level of confidence.

As the significant difference in analysis of co-variance in physical fitness among circuit training, aerobic fitness and control group in post and adjusted post-test phases are found, the post hoc test of paired group means of circuit training, aerobic fitness and control group was computed which is presented in Table 8.
TABLE 8
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS IN RELATION TO PHYSICAL FITNESS

<table>
<thead>
<tr>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Control Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>299.22</td>
<td>281.34</td>
<td>---</td>
<td>17.88</td>
<td>20.36</td>
</tr>
<tr>
<td>299.22</td>
<td>---</td>
<td>261.49</td>
<td>37.37*</td>
<td>20.36</td>
</tr>
<tr>
<td>---</td>
<td>281.34</td>
<td>261.49</td>
<td>19.85</td>
<td>20.36</td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.
Table 8 clearly indicates significant difference between circuit training and control group means, whereas no significant differences between circuit training and aerobic fitness groups as well as between aerobic fitness and control groups are observed.

**Discussion of Findings**

The Table 7 and Figure 1 clearly indicate no significant difference in physical fitness among circuit training, aerobic fitness and control group subjects in pre-test phase. It is also noticed that physical fitness mean values specially in circuit training and aerobic fitness and also in control group remain almost the same. Such insignificant difference and almost uniform mean values in pre-test phase clearly indicate that the random assignment of the groups were quite successful.

Further significant difference in physical fitness among circuit training, aerobic fitness and control group subjects in post and adjusted-post test phases are noticed. It is also observed that the mean values of the experimental groups, i.e., the circuit training and aerobic fitness groups have been significantly improved from pre to the post-test phase. Whereas such improvement in physical fitness means of control group subjects
from pre to the post-test phase are not noticed. From such result it may be assumed that the circuit training and aerobic fitness programme are having significant effect in improving physical fitness ability of the secondary school girls. Further it is specifically noticed that the rate of improvement in mean value in physical fitness of the circuit training group is found to be higher than that of aerobic fitness group which indicate the greater effect of circuit training programme in developing physical fitness ability of secondary school girls than that of aerobic fitness programme.

Table 8 in respect to paired group mean differences in physical fitness ability clearly indicates the significant difference in physical fitness between the circuit training and control group means, however, no significant differences in physical fitness means between the aerobic fitness and the control group as well as between circuit training and aerobic fitness groups are observed. Further it is noticed that the mean values of circuit training and aerobic fitness groups are found to be higher than that of the control group. Further it is also observed that the mean value of the circuit training group is found to be the highest in comparison to the aerobic fitness and the control group subjects. From such findings it
may be assumed that although both the circuit training and the aerobic fitness programme are having significant effect in developing physical fitness ability of the subjects of secondary school girls, yet the effect of circuit training programme in developing physical fitness ability of secondary school girls is admired to be the highest in comparison to the aerobic fitness programme.

Both the circuit training and aerobic fitness programmes are strenuous in nature where almost all the muscles of the body are activated in different degrees. Especially the circuit training programme are competitive in nature. Moreover the rough and toughness of the circuit training programme is more than that of aerobic fitness programme. The activities selected for this circuit training programme are mostly physical fitness oriented, where the long term effect of such training programme gradually enhance the muscle size, muscle power and muscular endurance capacity, which in turn helps to develop physical fitness ability of the subjects.

Probably because of such reasons, the significant effect of both the circuit training and aerobic fitness programmes on the developing physical fitness ability are observed. Further the effectiveness of circuit
training programme is noticed to be the highest in improving physical fitness ability of secondary school girls in comparison to the aerobic fitness programme.

The aforesaid finding is further supported by the finding of post-hoc test result (Table 8) where the adjusted post test mean difference values between circuit training and control groups and between aerobic fitness and control groups are found to be superior than that of mean difference values between circuit training and aerobic fitness groups. Further the higher mean values of circuit training programme and then aerobic fitness programme plays an important role in showing a greater paired mean difference which provide logical support in establishing the findings of greater significant effect of circuit training programme in developing physical fitness of secondary school girls.

This study is in consonance with the findings of Uppal1, Hardayal Singh2, Hockey3, Ajmer Singh.4

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1 Uppal, Physical Fitness How to Develop, p. 64.
3 Hockey, Physical Fitness-The Pathway to Healthful Living, p. 89.
4 Singh et. al., Essentials of Physical Education, p. 277.
Statement of Hypothesis

The hypothesis stated earlier in introductory chapter in respect to the significant difference in physical fitness among circuit training, aerobic fitness and control groups in pre-test phase is hereby accepted as no significant differences in physical fitness among circuit training, aerobic fitness and control group subjects in pre test phase is observed.

However, the hypothesis stated earlier in introductory chapter in respect to significant difference in physical fitness among circuit training, aerobic fitness and control group subjects in post and adjusted post-test phases are rejected as the significant difference in physical fitness among circuit training, aerobic fitness and control group subjects in post as well as adjusted post test phases are observed.

Anthropometric Variables

Weight

The statistical analysis of data of weight among circuit training, aerobic fitness and control group of secondary school girls was computed by using analysis of co-variance statistics which is presented in Table 9 and Figure 2.
# Table 9

## Analysis of Co-Variance of the Means of Two Experimental Groups and the Control Group in Weight

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>45.73</td>
<td>46.25</td>
<td>45.6</td>
<td>A 7.07</td>
<td>2</td>
<td>3.53</td>
<td>0.522</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 588.99</td>
<td>87</td>
<td>6.76</td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>42.6</td>
<td>42.6</td>
<td>42.76</td>
<td>A 0.55</td>
<td>2</td>
<td>0.278</td>
<td>0.019</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 1257.76</td>
<td>87</td>
<td>14.45</td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>42.67</td>
<td>42.38</td>
<td>42.90</td>
<td>A 4.035</td>
<td>2</td>
<td>2.01</td>
<td>0.160</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 1082.80</td>
<td>86</td>
<td>12.59</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  
A-Among Means Variance  
F=0.05 (2.86) 3.10  
W-Within Group Variance
FIGURE 2. COMPARISON OF WEIGHT AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
The Table 9 and Figure 2 reveal no significant difference in weight among circuit training, aerobic fitness and control group of secondary school girls in pre-test phase. The obtained ‘F’ value (‘F’= 0.522) is found to be lesser than required ‘F’ value (3.10) to be significant at 0.05 level of confidence. This shows that the random assignment of the group were quite successful. Similarly the ‘F’ ratio values for the post and adjusted post-test means also reveal no significant difference. The obtained ‘F’ values 0.019 and 0.160 are found to be lesser than the required ‘F’ value (3.10) to be significant at 0.05 level of confidence. However, considerable improvement in mean values in weight from pre to the post and adjusted post test phases are clearly observed.

Discussions of Findings

Table 9 and Figure 2 clearly indicate no significant differences in weight among circuit training, aerobic fitness and control group of secondary school girls in pre, post as well as adjusted post-test phases.

However, in the aforesaid table the decreased mean values of weight from pre to the post-test phase of two experimental groups (circuit training and aerobic fitness) and one control group are observed.
From such findings it may be assumed that the mean values of experimental groups decreased from pre to the post-test phase probably due to the positive effect of circuit training and aerobic fitness training programmes on the experimental groups. It is also observed that the degree of decrease of mean values in weight of aerobic fitness group is greater than that of circuit training group. On the other hand, the logic of decrease in mean value of weight of control group subjects from pre to the post-test phase is surprising and reason behind such decrease is not properly understood. However, it is assumed that the unknown involvement of control group subjects with physical activities might have assisted in decreasing their body weight.

Controlling of body weight involves watching one’s diet and following a healthful regimen, including regular amounts of physical activity. If a person is careful about calorie intake and engages regularly in physical activity, there will be a gradual weight reduction.\(^5\)

Circuit training and aerobic fitness programmes are more scientific and systematic type of physical training in nature, which helps in reduction of body fat and therefore at the initial stage of training the body

\(^5\) Bucher, *Foundation of Physical Education*, p. 183.
weight is decreased.\textsuperscript{6} Probably due to such reason the body weight of experimental groups are decreased.

Further most significant decrease in body weight is observed in case of aerobic fitness group in comparison to the circuit training group. From such finding it may be assumed that the aerobic fitness programme is more effective than circuit training programme in the reduction of body weight.

This is in consonance with the findings of W. W. Wilmore.\textsuperscript{7}

\textbf{Statement of Hypothesis}

The hypothesis stated earlier in introductory chapter in respect to the significant differences in weight among circuit training, aerobic fitness and control group subjects in pre, post and adjusted post-test phases are accepted as no significant differences in weight among circuit training, aerobic fitness and control group subjects in pre, post and adjusted post-test phases are observed.

\textsuperscript{6} Shaver, \textit{Essentials of Exercise Physiology}, p. 183.

\textsuperscript{7} Wilmore et al, \textit{Medicine and Science of Sports and Exercises}, 113-117.
Standing Height

The statistical analysis of data in standing height among two experimental groups namely circuit training and aerobic fitness groups and one control group of secondary school girls was computed by the analysis of co-variance which is presented in Table 10 and Figure 3.
### TABLE 10
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN STANDING HEIGHT

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>1.53</td>
<td>1.53</td>
<td>1.53</td>
<td>A 0.0001</td>
<td>2</td>
<td>0.0001</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 0.178</td>
<td>87</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>1.53</td>
<td>1.53</td>
<td>1.53</td>
<td>A 0.0001</td>
<td>2</td>
<td>0.0001</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 0.178</td>
<td>87</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>1.53</td>
<td>1.53</td>
<td>1.53</td>
<td>A 1.779</td>
<td>2</td>
<td>8.896</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 0.001</td>
<td>86</td>
<td>6.050</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10 A-Among Means Variance
F=0.05 (2.86) 3.10 W-Within Group Variance
**FIGURE 3.** COMPARISON OF STANDING HEIGHT AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS.
The Table 10 and Figure 3 of analysis of co-variance in standing height among circuit training, aerobic fitness and control group clearly indicate no significant ‘F’ ratio of 0.20 for the pre-test phase. This shows that the random assignment of the groups were quite successful. The ‘F’ ratio for the post-test and adjusted post-test phase means also reveal no significant differences among circuit training, aerobic fitness and control group subjects of secondary school girls at 0.05 level of confidence.

The obtained ‘F’ values in post and adjusted post-test means 0.20 and 0.001 respectively are found to be lesser than the required ‘F’ value of 3.10 to be significant at 0.05 level of confidence.

**Discussion of Findings**

The Table 10 and Figure 3 clearly indicate no significant difference in standing height among circuit training, aerobic fitness and control group subjects in pre, post and adjusted post-test phases.

The uniform mean values of standing height of circuit training, aerobic fitness and control group subjects are observed.

The insignificant difference in ‘F’ ratio values and uniform mean values of circuit training, aerobic fitness and control group subjects in pre-
test phase clearly indicate that random assignment of the group was quite successful.

It is also noticed that the mean values of standing height from pre to the post-test phase of aforesaid groups remained unchanged.

Standing height is such variable where very negligible change after a considerable period of time is observed. Probably the duration of 10 weeks is very little to observe the change in standing height of the subjects. Probably because of such reason no change in standing height of circuit training, aerobic fitness and control group subjects from pre to the post-test phase are noticed.

This study is in consonance with the findings of Kamlesh and Sangral. 8

Statement of Hypothesis

The hypothesis stated earlier in respect to significant difference in standing height among circuit training, aerobic fitness and control group subjects in pre, post and adjusted-post test phases are accepted as no

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8 Kamlesh and Sangral, Principles and History of Physical Education, p. 47.
significant differences among circuit training, aerobic fitness and control group subjects in pre, post and adjusted-post test phases are observed.

**Calf Girth**

The statistical analysis of data of calf girth among circuit training, aerobic fitness and control group of secondary school girls was computed by using analysis of co-variance which is presented in Table 11 and Figure 4.
### TABLE 11
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN CALF GIRTH

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>74.86667</td>
<td>75.95667</td>
<td>76.19333</td>
<td>A 0.150</td>
<td>2</td>
<td>0.075</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>W 259.419</td>
<td>87</td>
<td>2.982</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>75.023</td>
<td>76.08267</td>
<td>76.23667</td>
<td>A 1.149</td>
<td>2</td>
<td>0.574</td>
<td>0.192</td>
</tr>
<tr>
<td></td>
<td>W 260.371</td>
<td>87</td>
<td>2.993</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>77.985</td>
<td>78.019</td>
<td>77.796</td>
<td>A 0.872</td>
<td>2</td>
<td>0.436</td>
<td>5.550*</td>
</tr>
<tr>
<td></td>
<td>W 6.758</td>
<td>86</td>
<td>0.079</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 4: COMPARISON OF CALF GIRTH AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
Table 11 and Figure 4 in respect to the analysis of co-variance among two experimental groups and one control group in calf girth reveal insignificant difference in pre and post-test phases. The obtained ‘F’ values of 0.025 and 0.192 respectively are found to be lesser than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

However, the significant difference in adjusted post-test means is observed. The obtained ‘F’ value 5.550 is found to be greater than required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

As the significant difference in calf girth in adjusted post-test phase among two experimental groups and one control group is observed, further in order to find out the existence of paired group means difference, if any, the post-hoc test was computed which is presented in Table 12.
TABLE 12
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS IN RELATION TO CALF GIRTH

<table>
<thead>
<tr>
<th>Aerobic Fitness Group</th>
<th>Circuit Training Group</th>
<th>Control Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>78.019</td>
<td>77.985</td>
<td>---</td>
<td>0.034</td>
<td>0.143</td>
</tr>
<tr>
<td>---</td>
<td>77.985</td>
<td>77.796</td>
<td>0.189*</td>
<td>0.143</td>
</tr>
<tr>
<td>78.019</td>
<td>---</td>
<td>77.796</td>
<td>0.223*</td>
<td>0.143</td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.
Table 12 clearly indicate significant difference between circuit training and control group, as well as between aerobic fitness and control group subjects, whereas no significant difference between circuit training and aerobic fitness groups is observed.

**Discussion of Findings**

Table 11 and Figure 4 clearly indicate no significant differences in calf girth among circuit training, aerobic fitness and control group subjects in pre as well as post-test phases. However, in adjusted post-test phase the significant difference in calf girth among aforesaid groups is noticed.

Further little improvement of mean values of circuit training and aerobic fitness group subjects from pre to post and adjusted post-test phases are observed, whereas no such type of improvement in mean value of control group is noticed.

From such findings it may be assumed that both the circuit training and aerobic fitness programmes are having some significant effect in the improvement of calf girth.
In circuit training, some exercises like agility, speed, jumping, checking of speed etc. directly create maximum impact on the calf girth muscles which are likely to contribute for greater muscle mass in calf girth.

Further in aerobic fitness programme also quick change of body position in different directions, vertical and angular jumps, hopping and sudden check of speed also create maximum effect on calf girth muscle, which also seemed to contribute to greater muscle mass in calf girth of aerobic fitness group subjects.

Further the post-test mean value in calf girth of circuit training programme is found to be greater than pre test phase in comparison to the mean value of aerobic fitness group.

It is also rational to imagine that the thicker longitudinal and cross sectional muscle fibers serve as contributory factor of greater calf girth, which are known as the energy source in various running, jumping and turning movements and such movements were associated with the circuit training and aerobic fitness programmes of the study. Therefore the ten weeks circuit training and aerobic fitness programme probably have
contributed in some extent in improving the calf girth thickness of the experimental group subjects.

This study is in consonance with the findings of Piechaczek and Laska-Mierzejewska\(^9\) and Manilal.\(^{10}\)

**Statement of Hypothesis**

The hypothesis stated earlier in the introductory chapter in respect to significant differences in calf girth among circuit training, aerobic fitness and control groups in pre and post-test phases are accepted as no significant differences in aforesaid cases are observed.

On the other hand, the hypothesis stated earlier in cases of significant difference in calf girth among circuit training, aerobic fitness and control groups in adjusted post-test phases is rejected as the significant difference in calf girth among circuit training, aerobic fitness and control groups in adjusted post-test phases is observed.


\(^{10}\) Manilal, *(Unpublished Masters’ Thesis*, Jiwaji University).
**Thigh Girth**

The data of thigh girth among circuit training, aerobic fitness and control group of secondary school girls was computed by using analysis of co-variance, which is presented in Table 13 and Figure 5.
### Table 13
**Analysis of Co-Variance of the Means of Two Experimental Groups and the Control Group in Thigh Girth**

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>44.81667</td>
<td>44.96333</td>
<td>44.58333</td>
<td>A 2.204</td>
<td>2</td>
<td>1.102</td>
<td>0.053</td>
</tr>
<tr>
<td></td>
<td>W 1813.273</td>
<td>87</td>
<td></td>
<td>A 2.729</td>
<td>2</td>
<td>1.364</td>
<td>0.074</td>
</tr>
<tr>
<td></td>
<td>W 1602.752</td>
<td>87</td>
<td></td>
<td>W 1.415</td>
<td>2</td>
<td>0.708</td>
<td>0.372</td>
</tr>
<tr>
<td></td>
<td>W 163.780</td>
<td>86</td>
<td></td>
<td>W 1.904</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

\[ F=0.05 (2.87) 3.10 \]

A-Among Means Variance

\[ F=0.05 (2.86) 3.10 \]

W-Within Group Variance
Figure 5. Comparison of thigh girth among Circuit Training, Aerobic Fitness and one control group in pre, post and adjusted post-test means.
Table 13 and Figure 5 clearly indicate no significant difference in thigh girth among circuit training, aerobic fitness and control group of secondary school girls in pre-test phase, which shows that random assignment of the groups were quite successful. The obtained ‘F’ value in pre-test phase (0.053) is found to be lesser than required ‘F’ value (3.10) to be significant at 0.05 level of confidence.

No significant difference in thigh girth among circuit training, aerobic fitness and control group of secondary school girls are observed in post and adjusted post-test means also.

The obtained ‘F’ ratio values in post and adjusted post-test phases, 0.074 and 0.372 respectively, are found to be lesser than required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

**Discussion of Findings**

Table 13 and Figure 5 clearly indicate no significant difference in thigh girth among circuit training, aerobic fitness and control group subjects in pre, post and adjusted post-test phases. The insignificant
difference in pre-test phase indicates that the random assignment of the
groups were quite successful.

Further the almost uniform mean values of thigh girth of aerobic
fitness, circuit training and control group subjects in pre test phase are
observed. While after ten weeks of circuit training programme only, very
negligible improvement in mean values of thigh girth in post-test phase of
experimental group subjects are observed.

However the improvement of mean values from pre to the post-test
phases are so negligible which declined to show significant difference
among circuit training, aerobic fitness and control groups. From such
findings it may be assumed that circuit training and aerobic fitness
programmes has no significant effect on thigh girth of the subjects.

This study is in consonance with the findings of Piechaczek and
Laska-Mierzejewska and Manilal.\textsuperscript{12}

\textsuperscript{11} Piechaczek and Laska-Mierzejewska, \textit{Kinanthropometry II: International

\textsuperscript{12} Manilal, (\textit{Unpublished Masters' Thesis}, Jiwaji University).
Statement of Hypothesis

The hypothesis stated earlier in the introductory chapter in respect to significant difference among circuit training, aerobic fitness and control groups in pre, post and adjusted post-test phases are accepted, as no significant differences in aforesaid cases are observed.

Hip Girth

The statistical analysis of data of hip girth among circuit training, aerobic fitness and control group of secondary school girls was computed by analysis of co-variance which is presented in Table 14 and Figure 6.
TABLE 14
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN HIP GIRTH

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>78.48667</td>
<td>78.65333</td>
<td>78.67667</td>
<td>A</td>
<td>0.644</td>
<td>2</td>
<td>0.322</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>1713.083</td>
<td>87</td>
<td>19.691</td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>78.715</td>
<td>78.76</td>
<td>78.70667</td>
<td>A</td>
<td>0.049</td>
<td>2</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>1702.771</td>
<td>87</td>
<td>19.572</td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>78.832</td>
<td>78.713</td>
<td>78.636</td>
<td>A</td>
<td>0.585</td>
<td>2</td>
<td>0.292</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>33.393</td>
<td>86</td>
<td>0.388</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 6. COMPARISON OF HIP Girth AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
Table 14 and Figure 6 reveal no significant difference in hip girth among circuit training, aerobic fitness and control group of secondary school girls in pre-test phase, which indicates that the random assignment of the groups were quite successful. The obtained ‘F’ value 0.016 is found to be lesser than required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

No significant difference in hip girth among circuit training, aerobic fitness and control groups of secondary school girls in post and adjusted post-test means are also noticed. The obtained ‘F’ ratio values in post and adjusted post-test phases, i.e., 0.001 and 0.753 respectively, are found to be lesser than required ‘F’ value, i.e., 3.10 at 0.05 level of confidence.

**Discussion of Findings**

Table 14 and Figure 6 clearly indicates that there are no significant differences in hip girth among circuit training, aerobic fitness and control group in pre, post and adjusted post-test phases. However it is further noticed that the mean values of circuit training, aerobic fitness and control groups are found to be almost the same in pre, post and adjusted post-test
phases. Very little decrease in mean values of hip girth from pre to the post-test phase of experimental group subjects are observed. But such decrease in mean values are very negligible to reveal significant differences among circuit training, aerobic fitness and control groups in post test and adjusted post test phases. From such findings it may be assumed that neither circuit training and nor aerobic fitness programmes of ten weeks duration are having significant contribution in bringing about any significant change on hip girth of the subjects.

In this study in circuit training and aerobic fitness programmes mostly the upper and lower limbs activities are exercised. Therefore the hip muscles do not face specific stress and probably because of such reason no specific change of hip girth from pre to the post and adjusted post-test phases are observed. Probably due to such reason no significant difference among circuit training, aerobic fitness and control group in pre, post and adjusted post-test phases are observed.
This study is in consonance with the findings of Piechaczek and Laska-Mierzejewska\textsuperscript{13} and Manilal\textsuperscript{14}.

**Statement of Hypothesis**

The hypothesis stated earlier in the introductory chapter in respect to significant difference in hip girth among circuit training, aerobic fitness and control group in pre, post and adjusted post-test phases are hereby accepted, as there are no significant differences in hip girth among circuit training, aerobic fitness and control group in pre, post and adjusted post-test phases.

**Chest Girth**

Analysis of Co-variance of mean of two experimental groups and the control group in chest girth was computed in order to investigate the existence of significant difference among circuit training, aerobic fitness and control group of secondary school girls which is presented in Table 15 and Figure 7.


\textsuperscript{14} Manilal, *(Unpublished Masters’ Thesis*, Jiwaji University).
<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Test Means</strong></td>
<td>74.86667</td>
<td>75.95667</td>
<td>76.19333</td>
<td>A 30.042</td>
<td>2</td>
<td>15.021</td>
<td>0.617</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 2118.019</td>
<td>87</td>
<td>24.345</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.098</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Post-Test Means</strong></td>
<td>75.023</td>
<td>76.08267</td>
<td>76.23667</td>
<td>A 26.196</td>
<td>2</td>
<td>24.446</td>
<td>0.536</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 2126.815</td>
<td>87</td>
<td>0.103</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.312</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adjusted Post-Test Means</strong></td>
<td>75.829</td>
<td>75.798</td>
<td>75.715</td>
<td>A 0.205</td>
<td>2</td>
<td>0.078</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W 6.728</td>
<td>86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 7. COMPARISON OF CHEST GIRD AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
Table 15 and Figure 7 clearly indicate no significant difference in chest girth among circuit training, aerobic fitness and control group of secondary school girls in pre, post and adjusted post-test means. The obtained ‘F’ ratio values in pre, post and adjusted post-test means, 0.617, 0.536 and 1.312 respectively, are found to be lesser than required ‘F’ ratio value of 3.10 to be significant at 0.05 level of confidence.

**Discussion of Findings**

Table 15 and Figure 7 clearly indicates that there is no significant difference in chest girth among circuit training, aerobic fitness and control groups in pre-test phase. Among these groups very negligible variation of mean values are observed, which might have assisted in showing insignificant differences in pre-test phase among three groups (two experimental and one control group) undertaken in this study. Such insignificant difference indicates that the random assignment of the groups was quite successful.

Further no significant differences in chest girth among circuit training, aerobic fitness and control group in post and adjusted post-test phases are also observed. However very negligible improvement in the
mean values in chest girth of experimental group subjects from pre to the post-test phase are noticed. But such negligible improvement in mean values of chest girth are not enough to show the significant differences among three groups (two experimental and one control group) in post and adjusted post-test phases.

From such finding it may be assumed that neither circuit training and nor the aerobic fitness programmes have significant effect on chest girth. In circuit training and aerobic fitness programmes the lower limbs activities were more in numbers and thus the involvement of lower limbs muscles were much more than chest muscles or it may be said that the chest muscles were not much involved in circuit training and aerobic fitness programme and probably due to such reason the insignificant difference in chest girth among circuit training, aerobic fitness and control groups are noticed in pre, post and adjusted post-test phases.

This study is in consonance with the findings of Piechaczek and Laska-Mierzejewska\(^{15}\) and Manilal.\(^{16}\)

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**Statement of Hypothesis**

The hypothesis stated earlier in the introductory chapter in respect to significant difference in chest girth among circuit training, aerobic fitness and control group in pre, post and adjusted post-test phases are hereby accepted, as no significant differences are observed in chest girth among circuit training, aerobic fitness and control groups in pre, post and adjusted post-test phases are observed.

**Upper Arm Girth**

The statistical analysis of data of upper arm girth among circuit training, aerobic fitness and control group of secondary school girls was computed by using analysis of co-variance which is presented in Table 16 and Figure 8.
### TABLE 16
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN UPPER ARM GIRTH

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
<td>22.09</td>
<td>22.26333</td>
<td>21.37</td>
<td>A</td>
<td>13.465</td>
<td>2</td>
<td>6.732</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>544.660</td>
<td>87</td>
<td>6.260</td>
</tr>
<tr>
<td>Post-Test</td>
<td>22.38333</td>
<td>22.71</td>
<td>21.36667</td>
<td>A</td>
<td>29.449</td>
<td>2</td>
<td>14.724</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>539.235</td>
<td>87</td>
<td>6.198</td>
</tr>
<tr>
<td>Adjusted</td>
<td>22.204</td>
<td>22.360</td>
<td>21.895</td>
<td>A</td>
<td>3.282</td>
<td>2</td>
<td>1.641</td>
</tr>
<tr>
<td>Post-Test</td>
<td></td>
<td></td>
<td></td>
<td>W</td>
<td>12.808</td>
<td>86</td>
<td>0.149</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 8. COMPARISON OF UPPER ARM GIRTH AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS.
Table 16 and Figure 8 clearly indicate no significant difference of upper arm girth among circuit training, aerobic fitness and control group subjects in pre and post-test phases. The obtained ‘F’ ratio values in pre and post-test phases, 1.075 and 2.376 respectively, are found to be lesser than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

However, significant difference is observed in upper arm girth in adjusted post-test phase. The obtained ‘F’ value of 11.018 is found to be greater than required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

As the significant difference of upper arm girth among circuit training, aerobic fitness and control groups of secondary school girls are observed, further in order to investigate the existence of significant difference of paired group means the post-hoc test was computed which is presented in Table 17.
**TABLE 17**
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS RELATED TO UPPER ARM Girth

<table>
<thead>
<tr>
<th>Aerobic Fitness Group</th>
<th>Circuit Training Group</th>
<th>Control Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.360</td>
<td>22.204</td>
<td>---</td>
<td>0.156</td>
<td>0.197</td>
</tr>
<tr>
<td>22.360</td>
<td>22.204</td>
<td>21.895</td>
<td>0.309*</td>
<td>0.197</td>
</tr>
<tr>
<td>22.360</td>
<td>---</td>
<td>21.895</td>
<td>0.465*</td>
<td>0.197</td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.
The Table 17 clearly indicates that there is no significant difference in upper arm girth between paired group means of circuit training and aerobic fitness groups.

However, significant differences are observed in upper arm girth between circuit training and control groups as well as between aerobic fitness and control groups.

**Discussions of Findings**

Table 16 and Figure 8 clearly indicate no significant difference in upper arm girth among circuit training, aerobic fitness and control group subjects in pre as well as post-test phases. In pre-test phase the almost uniform mean values of two experimental and one control group as well as the insignificant difference among the group means indicate that the random assignment of the groups were quite successful.

However, the significant difference in upper arm girth in adjusted post-test phase is observed. The little improvement of mean values of experimental groups from pre to post and adjusted post-test phase are observed. However, no change in mean values of control group is observed. From such findings it may be assumed that circuit training and
aerobic fitness programmes are having some significant effect in increasing the upper arm girth of the secondary school girls.

This finding is further supported by the findings of post-hoc test result (Table 17) in which the existence of significant difference between circuit training and control group as well as between aerobic fitness and control group are noticed where the mean values of experimental groups are found to be higher than that of control group.

Further the post-test mean value in upper arm girth of aerobic fitness group is found to be greater than pre test phase in comparison to the mean value of circuit training group. From such observation it may be assumed that the aerobic fitness programme is more effective in improving upper arm girth than circuit training programme.

Probably in aerobic fitness programme the frequent involvement of upper limbs in different directions with various degrees of speed might have assisted for more significant development of upper arm girth of the subjects than that of circuit training programme.
This study is in consonance with the findings of Piechaczek and Laska-Mierzejewska\textsuperscript{17} and Manilal.\textsuperscript{18}

**Statement of Hypothesis**

The hypothesis stated earlier in the introductory chapter in respect to significant differences in upper arm girth among circuit training, aerobic fitness and control groups in pre as well as post-test phases are accepted, as no significant differences in upper arm girth among the subjects of aforesaid groups in pre and post-test phases are observed.

However, the hypothesis stated earlier in respect to adjusted post-test phase is rejected as the significant difference in upper arm girth among circuit training, aerobic fitness and control groups in adjusted post-test phase is observed.


\textsuperscript{18} Manilal, *(Unpublished Masters’ Thesis*, Jiwaji University).
Skinfold Measurement

Biceps Skinfold

The data in biceps skinfold among circuit training, aerobic fitness and control group of secondary school girls was computed by using analysis of co-variance, which is presented in Table 18 and Figure 9.
### TABLE 18
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN BICEPS SKINFOLD

<table>
<thead>
<tr>
<th></th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>2.65</td>
<td>2.733333</td>
<td>2.683333</td>
<td>A</td>
<td>0.106</td>
<td>2</td>
<td>0.053</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>26.183</td>
<td>87</td>
<td>0.301</td>
<td></td>
</tr>
<tr>
<td>Post-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>2.416667</td>
<td>2.45</td>
<td>2.633333</td>
<td>A</td>
<td>0.817</td>
<td>2</td>
<td>0.408</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>20.183</td>
<td>87</td>
<td>0.232</td>
<td></td>
</tr>
<tr>
<td>Adjusted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test</td>
<td>2.445</td>
<td>2.417</td>
<td>2.637</td>
<td>A</td>
<td>0.861</td>
<td>2</td>
<td>0.431</td>
</tr>
<tr>
<td>Means</td>
<td>W</td>
<td></td>
<td></td>
<td>6.043</td>
<td>86</td>
<td>0.070</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 9. COMPARISON OF BICEPS SKINFOLD AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
The Table 18 and Figure 9 indicate no significant difference in pre-test phase which shows that the random assignment of the groups were quite successful. The ‘F’ ratio value in pre-test phase 0.175 is found to be lower than required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

No significant difference in post-test phase is also noticed, where the obtained ‘F’ value (1.760) in post-test phase is also found to be lesser than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

However, significant difference among circuit training, aerobic fitness and control groups of secondary school girls in adjusted post-test phase is noticed. The obtained ‘F’ ratio value 6.128 is found to be greater than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

As significant difference in application of analysis of co-variance in biceps skinfold among circuit training, aerobic fitness and control group of secondary school girls was noticed, further in order to investigate the existence of significant difference of paired group means, the post-hoc test was computed which is presented in Table 19.
Table 19
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS RELATED TO BICEPS SKINFOLD

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>2.445</td>
<td>2.417</td>
<td>0.028</td>
<td>0.135</td>
</tr>
<tr>
<td>2.637</td>
<td>2.445</td>
<td>--</td>
<td>0.192*</td>
<td>0.135</td>
</tr>
<tr>
<td>2.637</td>
<td>--</td>
<td>2.417</td>
<td>0.22*</td>
<td>0.135</td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.
Table 19 indicates that the paired group mean differences between circuit training and control group, as well as between aerobic fitness and control groups are found to be significant. However, no significant difference in paired group means between circuit training and aerobic fitness group is noticed.

**Discussion of Findings**

Table 18 and Figure 9 clearly indicate no significant difference in biceps skinfold among circuit training, aerobic fitness and control groups in pre and post-test phases. The insignificant difference of biceps skinfold in pre-test phase indicate that the random assignment of the groups were quite successful.

However in the post-test phase it is observed that degree of decrease of mean values of biceps skinfold of experimental groups from the pre-test phase is greater than that of control group, which indicate the significant effect of circuit training and aerobic fitness programmes on biceps skinfold of secondary school girls.

On the other hand the significant difference is observed in adjusted post-test phase, where the obtained ‘F’ value 6.128 is found to be greater
than that of the required ‘F’ value 3.10 to be significant at 0.05 level of confidence. In this phase the mean values of experimental groups are decreased further in comparison to post-test phase. Probably such gross decrease in mean values of experimental groups in adjusted post-test phase have resulted the significant difference in adjusted post-test phase, which positively indicate the significant effect of circuit training and aerobic fitness programmes on biceps skinfold of secondary school girls.

It is further specifically noticed that the degree of decrease of biceps skinfold of aerobic fitness group is greater than that of circuit training group and thereby the significant effect of aerobic fitness programme on biceps skinfold is assumed to be higher than that of circuit training programme.

The activities of circuit training programme are specially executed by the lower limbs of the body. But in aerobic fitness programme both the upper and the lower limbs are almost equally involved. In such involvement the upper limb muscles are highly activated in different angles with various speed. Probably such activation level might have assisted in decreasing the biceps skinfold probably because of such reason
the significant difference in biceps skinfold among circuit training, aerobic fitness and control group in adjusted post-test phase is observed.

Table 19 clearly indicate the significant difference in paired group means between circuit training and control groups as well as between aerobic fitness and control groups. However no significant difference between aerobic fitness and circuit training groups are noticed which indicate the effect of circuit training and aerobic fitness programmes in decreasing biceps skinfold.

Further the lowest mean value of aerobic fitness group in comparison to the circuit training group prove greater effect of aerobic fitness programme in comparison to the circuit training programme in decreasing the biceps skinfold.

This study is in consonance with the findings of Wilmore\textsuperscript{19} and Shaver.\textsuperscript{20}


\textsuperscript{20} Shaver, \textit{Essentials of Exercise Physiology}, pp. 278-279.
Statement of Hypothesis

The hypothesis stated earlier in the introductory chapter in respect to significant difference among circuit training, aerobic fitness and control group in biceps skinfold in pre as well as post-test phases are accepted, as no significant differences in biceps skinfold among the subjects of aforesaid groups in pre and post-test phases are observed.

However, the hypothesis stated earlier in respect to adjusted post-test phase is rejected as the significant difference in biceps skinfold among circuit training, aerobic fitness and control group in adjusted post-test phase is observed.

Triceps Skinfold

The statistical analysis of the data in triceps skinfold among circuit training, aerobic fitness and control groups of secondary school girls was computed by using analysis of co-variance is presented in Table 20 and Figure 10.
## TABLE 20
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN TRICEPS SKINFOLD

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
<td>5.666667</td>
<td>5.583333</td>
<td>5.5</td>
<td>A</td>
<td>0.417</td>
<td>2</td>
<td>0.208</td>
</tr>
<tr>
<td>Means</td>
<td>W 86.208</td>
<td>87</td>
<td>0.991</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test</td>
<td>5.383333</td>
<td>5.233333</td>
<td>5.4</td>
<td>A</td>
<td>0.506</td>
<td>2</td>
<td>0.253</td>
</tr>
<tr>
<td>Means</td>
<td>W 74.908</td>
<td>87</td>
<td>0.861</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted</td>
<td>5.309</td>
<td>5.233</td>
<td>5.474</td>
<td>A</td>
<td>0.906</td>
<td>2</td>
<td>0.453</td>
</tr>
<tr>
<td>Post-Test</td>
<td>W 7.023</td>
<td>86</td>
<td>0.082</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE 10. COMPARISON OF TRICEPS SKINFOLD AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
The Table 20 and Figure 10 clearly indicate that there is no significant differences in pre and post-test phases in triceps skinfold measurement among circuit training, aerobic fitness and control groups of secondary school girls. The observed ‘F’ values of 0.210 and 0.294 respectively are found to be lesser than required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

However, the significant difference in triceps skinfold measurement among two experimental and one control group in adjusted post-test phase is noticed, in which the obtained ‘F’ value 5.545 is found to be greater than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

As the significant difference in triceps skinfold among two experimental and one control group of secondary school girls was observed in adjusted post-test phase, further in order to investigate the existence of significant difference of paired group means the post hoc test was computed, which is presented in Table 21.
Table 21
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS RELATED TO TRICEPS SKINFOLD

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.474</td>
<td>5.309</td>
<td>5.233</td>
<td>0.076</td>
<td>0.146</td>
</tr>
</tbody>
</table>
| *Significant at 0.05 level of confidence.*
Table 21 clearly indicates no significant differences of paired group means in triceps skinfold between circuit training and aerobic fitness groups. However, significant differences between circuit training and control groups, as well as between aerobic fitness and control groups are observed.

Discussion of Findings

Table 20 and Figure 10 clearly indicate no significant differences among circuit training, aerobic fitness and control groups in pre and post-test phases. The insignificant difference of pre-test phase indicate the random assignment of the groups were quite successful.

Further, it is observed that post-test mean values of triceps skinfold measurement of both the experimental groups have been slightly decreased from the pre-test phase. However, the same is not noticed in case of control group, which indicates the significant effects of aerobic fitness and circuit training programmes in decreasing the triceps skinfold of secondary school girls. It is also further observed that the rate of decrease of mean value of aerobic fitness group from pre to the post-test phase is greater than that of circuit training group, which indicate the
greater effect of aerobic fitness programme in reducing the triceps skinfold than that of circuit training programme.

The significant difference in triceps skinfold among circuit training, aerobic fitness and control groups in adjusted post-test phase is observed, where the obtained 'F' value 5.545 is found to be greater than that of the required 'F' value 3.10 to be significant at 0.05 level of confidence. Both in post and adjusted post-test phases it is noticed that the mean values of aerobic fitness and circuit training groups are decreased from the pre test phase in comparison to the control group. Further it is also noticed that the rate of decreased mean value in aerobic fitness group is greater than that of circuit training group. Probably such greater decrease of mean value of aerobic fitness group once again prove the greater effect of aerobic fitness programme in decreasing triceps skinfold.

From the above result, it may be assumed that both the circuit training and the aerobic fitness programmes are having significant contribution in decreasing the triceps skinfold. Specially the greater decrease of mean values of aerobic fitness group highlight the greater effect of aerobic fitness programme in decreasing the triceps skinfold.
The activities of circuit training and aerobic fitness programmes are specially executed by the upper and lower limbs of the body. Specially the involvement of upper limb muscles in case of aerobic fitness programme is more than that of circuit training programme. In such cases the upper limb muscles are highly activated in different angles in various speed and such activation level might have assisted in decreasing the triceps skinfold. Probably because of above reason the decrease in triceps skinfold in circuit training and aerobic fitness groups in post and adjusted post-test phases are observed in comparison to the pre test phase and probably because of such reason the significant difference in triceps skinfold among circuit training, aerobic fitness and control groups in adjusted post-test phase is noticed.

Further the Table 21 (post-hoc test) of paired adjusted final mean differences clearly indicate the significant difference between circuit training and control groups as well as between aerobic fitness and control groups, in which the mean values of experimental groups are found to be lower than control group, which once again prove the effective contribution of circuit training and aerobic fitness training programmes in decreasing the triceps skinfold.
Further the lowest mean value of aerobic fitness group in comparison to the circuit training group prove the greater effect of aerobic fitness programme in decreasing the triceps skinfold.

This study is in consonance with the findings of Wilmore\textsuperscript{21} and Shaver\textsuperscript{22}.

**Statement of Hypothesis**

The hypotheses stated earlier in the introductory chapter in respect to significant differences among circuit training, aerobic fitness and control groups in triceps skinfold in pre as well as in post-test phases are accepted, as no significant differences are observed in triceps skinfold among circuit training, aerobic fitness and control groups in pre as well as in post-test phases.

However, the hypothesis stated earlier in respect to significant difference of triceps skinfold among circuit training, aerobic fitness and


\textsuperscript{22} Shaver, *Essentials of Exercise Physiology*, pp. 278-279.
control groups in adjusted post-test phase is rejected as the significant difference is observed in adjusted post-test phase is observed.

**Supra Iliac Skinfold**

The statistical analysis of supra iliac skinfold measurement among circuit training, aerobic fitness and control groups of secondary school girls, was computed by analysis of co-variance statistics which is presented in Table 22 and Figure 11.
TABLE 22
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN SUPRA ILIAC SKINFOLD

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>15.31667</td>
<td>15.58333</td>
<td>15.26667</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Å</td>
<td></td>
<td></td>
<td>1.739</td>
<td>2</td>
<td>0.869</td>
<td>0.100</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>753.150</td>
<td>87</td>
<td>8.657</td>
<td></td>
</tr>
<tr>
<td>Post-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>14.26667</td>
<td>13.6</td>
<td>15.01667</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Å</td>
<td></td>
<td></td>
<td>30.139</td>
<td>2</td>
<td>15.069</td>
<td>2.004</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>654.308</td>
<td>87</td>
<td>7.521</td>
<td></td>
</tr>
<tr>
<td>Adjusted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td>14.331</td>
<td>13.428</td>
<td>15.125</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Å</td>
<td></td>
<td></td>
<td>43.159</td>
<td>2</td>
<td>21.579</td>
<td>28.646*</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>64.784</td>
<td>86</td>
<td>0.753</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE. 11. COMPARISON OF SUPRA ILIAC SKINFOLD AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS.
The Table 22 and Figure 11 reveal no significant differences in pre and post-test phases in supra iliac skinfold measurement among circuit training, aerobic fitness and control groups of secondary school girls. The observed 'F' values of 0.100 and 2.004 respectively are found to be lesser than required 'F' value 3.10 to be significant at 0.05 level of confidence.

However, in adjusted post-test phase significant difference is noticed in supra iliac skinfold measurement among circuit training, aerobic fitness and control group. The obtained 'F' ratio value 28.646 is found to be greater than the required 'F' value 3.10 to be significant at 0.05 level of confidence.

As the significant difference in adjusted post-test means among two experimental groups and one control group in supra iliac skinfold was observed, in order to investigate the existence of paired group means differences, the post-hoc test was computed, which is presented in Table 23.
<table>
<thead>
<tr>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>14.331</td>
<td>13.428</td>
<td>0.903*</td>
<td>0.443</td>
</tr>
<tr>
<td>15.125</td>
<td>14.331</td>
<td>---</td>
<td>0.794*</td>
<td>0.443</td>
</tr>
<tr>
<td>15.125</td>
<td>---</td>
<td>13.428</td>
<td>1.697*</td>
<td>0.443</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.
Table 23 clearly indicates that all the paired group means differences, i.e., between circuit training and aerobic fitness groups, between circuit training and control groups as well as between aerobic fitness and control groups showed significant differences as all the mean differences values of aforesaid paired group means are found to be greater than that of critical difference value.

**Discussion of Findings**

Table 22 and Figure 11 clearly indicate no significant difference in supra iliac skinfold among circuit training, aerobic fitness and control groups in pre-test phase which indicates that the random assignment of the groups were quite successful. Similarly no significant difference in post test phase are also observed.

Whereas the significant difference in supra iliac skinfold in adjusted post-test phase is observed where the obtained ‘F’ value 28.646 is found to be greater than that of required ‘F’ value 3.10 to be significant at 0.05 level of confidence. It is noticed that the post and adjusted post test phases mean values in supra iliac skinfold of experimental groups are decreased significantly from the pre test phase. It is also noticed that the
rate of decrease in mean values of aerobic fitness group is found to be greater than that of circuit training group.

Probably such significant decreased in mean value of aerobic fitness group along with the decreased mean value of circuit training group from pre to the post and adjusted post-test phases in comparison to the control group might have resulted in significant difference in adjusted post-test phase.

From such result it may be assumed that both the circuit training and the aerobic fitness programmes are having significant contribution in decreasing the supra iliac skinfold. Especially the greater decrease in mean value of aerobic fitness group from pre to the post and adjusted post-test phases highlights its greater effect in decreasing the supra iliac skinfold.

The activities of the circuit training and the aerobic fitness programmes are mostly oriented with upper and lower limb muscles of the body. Specially in case of aerobic fitness programme the involvement of upper limb and abdominal muscles is more than that of circuit training programme, where the upper limb and abdominal muscles are activated in different angle with different speed. Such activation level might have
assisted in decreasing the supra iliac skinfold. Probably because of such reason the significant changes in mean values of supra iliac skinfold of aerobic fitness and circuit training groups from pre to the post and adjusted post-test phases are observed and such decrease in mean values might have resulted in significant difference in adjusted post-test phase.

Further Table 23 of paired adjusted final means differences clearly indicate the significant difference among circuit training and control group as well as between aerobic fitness and control group in which the mean values of aforesaid experimental groups are found to be lower and thus better than control group which once again prove the effective contribution of circuit training and aerobic fitness training programme in decreasing the supra iliac skinfold of the subjects belonging to the experimental groups.

Further the lowest mean value of aerobic fitness group in comparison to the circuit training group prove greater effect of aerobic fitness programme in comparison to the circuit training programme in decreasing the supra iliac skinfold.
This study is in consonance with the findings of Wilmore\textsuperscript{23} Shaver\textsuperscript{24} and Bucher.\textsuperscript{25}

**Statement of Hypothesis**

The hypothesis stated earlier in the introductory chapter in respect to significant difference in supra iliac skinfold among circuit training, aerobic fitness and control group in pre as well as post-test phases are accepted, as no significant differences are observed in aforesaid groups.

However, the hypothesis stated earlier in respect to significant difference in supra iliac skinfold among circuit training, aerobic fitness and control group in adjusted post-test phase is rejected as the significant difference in adjusted post-test phase is observed.


\textsuperscript{24} Shaver, *Essentials of Exercise Physiology*, pp. 278-279.

\textsuperscript{25} Bucher, *Foundation of Physical Education*, p. 260.
Sub Scapular Skinfold

To investigate the existence of significant difference in sub scapular skinfold among circuit training, aerobic fitness and control group of secondary school girls the analysis of co-variance was computed which is presented in Table 24 and Figure 12.
**TABLE 24**  
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN SUB SCAPULAR SKINFOLD

<table>
<thead>
<tr>
<th></th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Test Means</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.16667</td>
<td>14.73333</td>
<td>13.65</td>
<td>A</td>
<td>17.617</td>
<td>8</td>
<td>1.040</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>737.108</td>
<td>87</td>
<td>8.473</td>
</tr>
<tr>
<td><strong>Post-Test Means</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.76667</td>
<td>13.2</td>
<td>13.5333</td>
<td>A</td>
<td>4.867</td>
<td>2</td>
<td>0.315</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>672.133</td>
<td>87</td>
<td>7.726</td>
</tr>
<tr>
<td><strong>Adjusted Post-Test Means</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.782</td>
<td>12.686</td>
<td>14.031</td>
<td>A</td>
<td>30.076</td>
<td>2</td>
<td>15.038</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>29.285</td>
<td>86</td>
<td>0.341</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  
A-Among Means Variance

F=0.05 (2.86) 3.10  
W-Within Group Variance
FIGURE 12. COMPARISON OF SUB SCAPULAR SKINFOLD AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
The Table 24 and Figure 12 clearly indicate no significant difference in pre and post-test phases as the obtained ‘F’ ratio values of 1.040 and 0.315 respectively are found to be lesser than that of required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

However, significant difference is observed in sub scapular skinfold among circuit training, aerobic fitness and control groups in adjusted post-test means. The observed ‘F’ value 44.161 is found to be greater than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

As in analysis of co-variance the significant difference among circuit training, aerobic fitness and control groups in sub scapular skinfold in adjusted post-test means was noticed, in order to investigate the existence of paired group means, the post-hoc test was computed, which is presented in Table 25.
TABLE 25
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS IN RELATION TO SUB SCAPULAR SKINFOLD

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>13.782</td>
<td>12.686</td>
<td>1.096*</td>
<td>0.298</td>
</tr>
<tr>
<td>14.031</td>
<td>13.782</td>
<td>---</td>
<td>0.249</td>
<td>0.298</td>
</tr>
<tr>
<td>14.031</td>
<td>---</td>
<td>12.686</td>
<td>1.345*</td>
<td>0.298</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.
The Table 25 of paired adjusted final means clearly indicates significant differences between circuit training and aerobic fitness group as well as between aerobic fitness and control group of secondary school girls. Whereas no significant difference between circuit training and control groups are noticed.

**Discussion of Findings**

Table 24 and Figure 12 clearly indicate no significant differences in sub scapular skinfold among circuit training, aerobic fitness and control groups in pre and post-test phases. The insignificant difference in pre test phase indicates that the random assignment of the groups were quite successful.

In post-test phase, it is observed that the mean values of experimental groups are slightly decreased from the pre-test phase. However no such decrease in mean value of control group from pre to the post-test phase is noticed.

On the other hand the significant difference in adjusted post-test phase is observed where the obtained ‘F’ value 44.161 is found to be greater than that of required ‘F’ value 3.10 to be significant at 0.05 level
of confidence. In this phase it is also observed that the mean values of experimental groups are further decreased from post-test phase. The rate of decrease of mean value in aerobic fitness group is found to be higher than that of circuit training group. Probably such decreased mean value of aerobic fitness and circuit training groups from pre to the post and adjusted post-test phases in comparison to the control group might have resulted in significant difference in adjusted post-test phase.

From such result it may be assumed that both the circuit training and the aerobic fitness programmes are having significant contribution in decreasing the sub scapular skinfold of experimental groups. Especially the greater decrease in mean value of aerobic fitness group highlights the greater effect of aerobic fitness programme in decreasing the sub scapular skinfold.

The activities of the circuit training and the aerobic fitness programmes are mainly performed by the upper and lower limbs muscles of the body, and such activities might have assisted in decreasing sub scapular skinfold from pre to the post and adjusted post-test phases of circuit training and aerobic fitness groups. Specially the involvement of upper limb and upper back muscles in case of aerobic fitness programme
is more than that of circuit training programme, where the upper limb and upper back muscles are activated in different angles with various speed and such activation level might have assisted in greater decreasing the sub scapular skinfold of aerobic fitness group. Further the significant decrease in mean values of sub scapular skinfold of circuit training and aerobic fitness groups from pre to the post-test phase might have resulted in significant difference in adjusted post-test phase.

Further the Table 25 of paired final mean differences clearly indicate the significant differences between circuit training and aerobic fitness groups as well as between circuit training and control groups, where the mean values of experimental groups are found to be lesser than control group means which once again prove the significant effect of circuit training and aerobic fitness training programme in decreasing the sub scapular skinfold of experimental group subjects.

Further the lowest mean value of aerobic fitness group in comparison to the circuit training group prove greater significant effect of aerobic fitness programme in decreasing the sub scapular skinfold of secondary school girls.
This study is in consonance with the findings of Wilmore\textsuperscript{26}, Shaver\textsuperscript{27}.

\textbf{Statement of Hypothesis}

The hypothesis stated earlier in the introductory chapter in respect to the significant difference in sub scapular skinfold among circuit training, aerobic fitness and control groups in pre and post-test phases are hereby accepted, as no significant differences in sub scapular skinfold among circuit training, aerobic fitness and control group in pre and post-test phases are observed.

Whereas the hypothesis stated earlier in respect to significant differences in sub scapular skinfold among two experimental and one control group in adjusted post-test phase is rejected as the significant difference in sub scapular skinfold among circuit training, aerobic fitness and control groups in adjusted post-test phase is observed.

\textsuperscript{26} Wilmore et al., \textit{Medicine and Science Sports and Exercises}, 113-117.

\textsuperscript{27} Shaver, \textit{Essentials of Exercise Physiology}, pp. 278-279.
Physiological Variables

Resting Heart Rate

The statistical analysis of data in resting heart rate of secondary school girls among two experimental groups and one control group undertaken in this study was computed using analysis of co-variance. The data pertaining to this have been presented in Table 26. The same is also graphically represented in Figure 13.
TABLE 26
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN RESTING HEART RATE

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>79.6</td>
<td>79.433</td>
<td>77.6</td>
<td>73.88</td>
<td>2</td>
<td>36.94</td>
<td>2.11</td>
</tr>
<tr>
<td></td>
<td>W 1453.76</td>
<td></td>
<td></td>
<td></td>
<td>87</td>
<td>16.71</td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>76.56667</td>
<td>75.9</td>
<td>77.23333</td>
<td>26.66</td>
<td>2</td>
<td>13.33</td>
<td>0.990</td>
</tr>
<tr>
<td></td>
<td>W 1171.43</td>
<td></td>
<td></td>
<td></td>
<td>87</td>
<td>13.46</td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>76.002</td>
<td>75.466</td>
<td>78.232</td>
<td>123.24</td>
<td>2</td>
<td>61.62</td>
<td>18.667*</td>
</tr>
<tr>
<td></td>
<td>W 283.89</td>
<td></td>
<td></td>
<td></td>
<td>86</td>
<td>3.30</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10 A-Among Means Variance
F=0.05 (2.86) 3.10 W-Within Group Variance
FIGURE 13. COMPARISON OF RESTING HEART RATE AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS.
Table 26 and Figure 13 reveal no significant differences in resting heart rate in pre and post-test phases among circuit training, aerobic fitness and control groups. The obtained ‘F’ values 2.11 and 0.990 respectively are found to be lesser than required ‘F’ value 3.10 to be significant at 0.05 level of confidence. This shows that the random assignment of the groups were quite successful. However, the ‘F’ ratio value 18.667 for adjusted post-test mean is found to be significant for being greater than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

As in analysis of co-variance the significant difference in resting heart rate in adjusted post-test means among circuit training, aerobic fitness and one control groups are found. Further in order to find out the existence of significant difference between paired adjusted final means, the post-hoc test was computed, which is presented in Table 27.
### TABLE 27
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS IN RELATION TO RESTING HEART RATE

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>76.002</td>
<td>75.466</td>
<td>0.536</td>
<td>0.928</td>
</tr>
<tr>
<td>78.232</td>
<td>76.002</td>
<td>---</td>
<td>2.23*</td>
<td>0.928</td>
</tr>
<tr>
<td>78.232</td>
<td>---</td>
<td>75.466</td>
<td>2.766*</td>
<td>0.928</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.
The Table 27 in respect to the paired adjusted final means clearly indicates no significant difference between circuit training and aerobic fitness groups in resting heart rate of secondary school girls. However, significant difference between circuit training and control group, and between aerobic fitness and control group are noticed.

**Discussion of Findings**

Table 26 and Figure 13 reveal significant difference in resting heart rate in adjusted post-test means (‘F’=18.66 > 3.10) at 0.05 level of confidence among two experimental groups and one control group.

However significant differences in pre and post-test phases are observed.

It is noticed that the mean values of circuit training (M=79.60) and aerobic fitness programmes (M=79.433) in the pre-test phase remained almost the same. From such findings it may be assumed that initially no significant difference are existed between the circuit training and the aerobic fitness groups.

Further it is noticed that the mean values of resting heart rate of circuit training and aerobic fitness groups decreased significantly from pre
to the post-test phases whereas no such decrease in mean values of control group is noticed.

From such findings it may be assumed that circuit training and aerobic fitness programmes are having significant effect on resting heart rate of experimental group subjects and probably because of such reason the resting heart rate of experimental groups have decreased from pre to the post-test phase.

Further it is also noticed that the rate of decreased heart rate of aerobic fitness programme is greater than that of circuit training programme, which probably indicates the greater significant effect of aerobic fitness programme on resting heart rate than that of circuit training programme. Further, the post-hoc test (Table 27) clearly indicates no significant difference in resting heart rate between circuit training and aerobic fitness group. Such result indicates that the effect of both the circuit training and the aerobic fitness programme on resting heart rate is almost the same. However, the lowest mean value in resting heart rate of aerobic fitness group indicates the greater significant effect of aerobic fitness programme on resting heart rate than that of circuit training programme.
The aerobic fitness training is designed with music, which helps the individual to continue the dancing exercise programme with full interest in full swing keeping aside the physical and mental fatigue in comparison to the circuit training programme which helps the individual in undertaking proposed load with full interest. Probably because of such reason slight better effect of aerobic fitness programme on resting heart rate is noticed in comparison to the circuit training programme.

As per literature we know that the blood pumped from the heart per minute (cardiac output) depends upon stroke volume and heart rate.

It is in evidence that as the heart ability increases, the rate of heart decreases. Thus they are invariably correlated.\(^{28}\)

With endurance training, while the thickness of the ventricular wall remains normal, the size (volume) of the ventricular cavity of the heart becomes large which means that it is able to hold more blood during the resting or diastolic period. The thickness of the ventricular wall increases while the size remains normal. As training progresses, this results not only in a slower heart rate for a standard sub-maximal workload, but also in a slower resting heart rate (bradycardia) and a slight decrease in maximal

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\(^{28}\) Shaver, *Essentials of Exercise Physiology*, p.90.
heart rate. The increased size of the heart causes stroke volume and cardiac output to be increased. This greater efficiency of the heart (circulating more blood while beating less frequently) allows a larger blood flow to reach the muscle with less stress imposed on the heart, lungs and vascular system. For stroke volume, there is not only an increase in the resting volume, but also sub-maximal and maximal exercise volumes are increased. In the case of cardiac output, maximal cardiac output is increased, however, for rest and a standard sub-maximal workload cardiac output has not significantly changed. Since cardiac output for the trained and the untrained persons are about the same during the rest and sub-maximal work, it is obvious that the trained person is able to accomplish his or her cardiac output at a much lower heart rate.  

Further Mushaff et al. have shown that the resting cardiac output remains unaltered after training. This is mediated through the automatic nervous system by increasing the vegal tone and thereby reducing the discharge from sino-auriculor node. The probable explanation for the

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29 Shaver, Essentials of Exercise Physiology, p.268.

decrease in heart rate is that, as a result of training the stroke volume increases due to hypertrophy of the cardiac muscle. Since the cardiac stroke volume under resting conditions increased, the resting heart rate was reduced to maintain the same level.

Probably because of such reasons, the resting heart rate of aerobic fitness and circuit training groups are found to be decreased than that of control group, which clearly reflect the significant effect of aerobic fitness and circuit training programmes in reducing the resting heart rate of aerobic fitness and circuit training group of secondary school girls.

This study is in consonance with the findings of Alteri, Stamp, Frank and Abraham.

**Statement of Hypothesis**

The hypothesis stated earlier in introductory chapter in respect to significant differences in resting heart rate in pre and post-test phases are

31 Alteri, *Dissertation Abstracts International*, 3483-A.


hereby accepted as no significant differences are observed in resting heart rate among circuit training, aerobic fitness and control group in pre and post-test phases.

Whereas the hypothesis stated earlier in respect to significant difference of resting heart rate among circuit training, aerobic fitness and control groups in adjusted post-test phase is rejected as the significant difference in resting heart rate among aforesaid groups in adjusted post test phase is observed.

**Working Heart Rate**

The data in working heart rate among circuit training, aerobic fitness and control groups of secondary school girls was treated using analysis of co-variance. The data pertaining to this have been presented in Table 28. The same is also graphically represented in Figure 14.
TABLE 28
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN WORKING HEART RATE

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>176</td>
<td>175.433</td>
<td>175</td>
<td>A</td>
<td>15.089</td>
<td>2</td>
<td>7.544</td>
</tr>
<tr>
<td></td>
<td>W 1791.36</td>
<td>87</td>
<td>20.590</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>172.3</td>
<td>168.9</td>
<td>174.2</td>
<td>A</td>
<td>432.60</td>
<td>2</td>
<td>216.30</td>
</tr>
<tr>
<td></td>
<td>W 1949.80</td>
<td>87</td>
<td>22.411</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>171.840</td>
<td>168.939</td>
<td>174.621</td>
<td>A</td>
<td>483.59</td>
<td>2</td>
<td>241.79</td>
</tr>
<tr>
<td></td>
<td>W 559.224</td>
<td>86</td>
<td>6.503</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence
F=0.05 (2.87) 3.10 A-Among Means Variance
F=0.05 (2.86) 3.10 W-Within Group Variance
FIGURE 14. COMPARISON OF WORKING HEART RATE AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS
The Table 28 and Figure 14 reveal no significant difference in the pre test phase. The obtained ‘F’ value of 0.366 is found to be lesser than that of required ‘F” value of 3.10 to be significant at 0.05 level of confidence. This shows that the random assignment of the groups were quite successful. However, the obtained ‘F’ ratio for the post test and adjusted post-test phases reveal the values of 9.651 and 37.185 respectively which are found to be significant for being greater than the required ‘F’ value of 3.10 to be significant at 0.05 level of confidence. This indicate that there are significant differences in post and adjusted post-test phases in working heart rate among circuit training, aerobic fitness and control group of secondary school girls.

As the significant difference in analysis of co-variance the working heart rate in post and adjusted post-test phases among circuit training, aerobic fitness and control groups is found further in order to find out the existence of significant difference, if any, between paired group means, the post hoc test was computed which is presented in Table 29.
TABLE 29
PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE DIFFERENT GROUPS IN RELATION TO WORKING HEART RATE

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Aerobic Fitness Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>171.840</td>
<td>168.933</td>
<td>2.901*</td>
<td>1.30</td>
</tr>
<tr>
<td>174.621</td>
<td>171.840</td>
<td>---</td>
<td>2.781*</td>
<td>1.30</td>
</tr>
<tr>
<td>174.621</td>
<td>---</td>
<td>168.933</td>
<td>5.682*</td>
<td>1.30</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.
The Table 29 indicates the significant difference in all the paired group means, i.e., between circuit training and aerobic fitness groups, between circuit training and control groups as well as between aerobic fitness and control groups, which indicate a significant value gain of 2.901, 2.781 and 5.682 respectively, which are found to be greater than the critical difference value of 1.30.

**Discussion of Findings**

Table 28 and Figure 14 reveal no significant difference in working heart rate in pre test phase of analysis of co-variance among circuit training, aerobic fitness and control groups. However, significant difference in post and adjusted post-test phases are observed.

In pre-test phase the insignificant ‘F’ ratio value and almost uniform mean values in working heart of circuit training (M=176), aerobic fitness (M=175.433) and control groups (M=175) of secondary school girls clearly indicate that the random assignment of the groups was quite successful.

The significant differences are observed in post and adjusted post-test phases. The obtained ‘F’ values 9.651 and 37.185 respectively are found to be greater than that of the required ‘F’ value 3.10 to be
significant at 0.05 level of confidence. In post and adjusted post-test phases it is clearly noticed that the mean values of the aerobic fitness and circuit training groups decreased significantly than that of pre test phase (for circuit training, pre = 176, post = 172.3 and adjusted post test = 171.840; and for aerobic fitness pre = 175.433, post = 168.9 and adjusted post = 168.939), whereas under control group no such significant decrease of mean value from pre to the post test phase are noticed (control group pre = 175, post = 174.2, and adjusted post test = 174.621). From such result the significant effect of circuit training and aerobic fitness programme on working heart rate may be logically admitted.

Further the post-hoc test result (Table 29) of paired group mean differences reflects the greater degree of paired mean difference in between aerobic fitness and control groups than that of paired mean difference between circuit training and aerobic fitness group. Such greater difference between the aerobic fitness and control group appeared probably due to the lowest mean value of aerobic fitness group, and thereby the greater effect of aerobic fitness programme on working heart rate is logically assumed.
In this study the aerobic fitness and circuit training programmes were composed with the endurance, agility, power, speed and coordination components of physical fitness. The effect of such activities for ten weeks circuit training and aerobic fitness programmes might have played the significant role on the working heart rate of secondary school girls.

Probably because of such reason the lesser working heart rate of aerobic fitness and circuit training groups are observed, which reflect the significant effect of aerobic fitness and circuit training programmes on working heart rate of secondary school girls.

This study is in consonance with the findings of Bucher.35

Statement of Hypothesis

The hypothesis stated earlier in introductory chapter in respect to significant difference in working heart rate in pre-test phase is hereby accepted as no significant difference is observed in working heart rate among circuit training, aerobic fitness and control groups in pre test phase.

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Whereas the hypothesis stated earlier in respect to working heart rate among circuit training, aerobic fitness and control groups in post and adjusted post-test phases are rejected as the significant differences in working heart among circuit training, aerobic fitness and control groups in post and adjusted post-test phase are observed.

**Resting Systolic Blood Pressure**

To investigate the existence of significant difference of resting systolic blood pressure among circuit training, aerobic fitness and control group of secondary school girls the analysis of co-variance was computed which is presented in Table 30. The same is also graphically represented in Figure 15.
### TABLE 30
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN RESTING SYSTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th></th>
<th>Mean Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>117.2333</td>
<td>116.9</td>
<td>116.9</td>
<td>A</td>
<td>2</td>
<td>1.111</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>3460.76</td>
<td>87</td>
<td>39.779</td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>118.7333</td>
<td>119.2333</td>
<td>115.0667</td>
<td>A</td>
<td>2</td>
<td>155.278</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>11627.10</td>
<td>87</td>
<td>133.648</td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>118.641</td>
<td>119.280</td>
<td>115.113</td>
<td>A</td>
<td>2</td>
<td>151.065</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td>11028.121</td>
<td>86</td>
<td>128.234</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A - Among Means Variance
F=0.05 (2.86) 3.10  W - Within Group Variance
FIGURE 15. COMPARISON OF RESTING SYSTOLIC BLOOD PRESSURE AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS.
Table 30 and Figure 15 reveal no significant differences in resting systolic blood pressure among circuit training, aerobic fitness and control groups in pre, post and adjusted post-test means at 0.05 level of confidence.

The obtained ‘F’ ratio value in pre (0.02), post (1.1) and adjusted post-test means (1.1) are found to be lesser than the required ‘F’ value 3.10 to be significant at 0.05 level of confidence.

**Discussion of Findings**

Table 30 and Figure 15 clearly indicate the insignificant differences in resting systolic blood pressure among circuit training, aerobic fitness and control groups in pre, post and adjusted post-test phases at 0.05 level of confidence.

In the pre-test, the mean values of circuit training (M=117.2333), aerobic fitness (M=116.9) and control groups (M=116.9) are found to be almost the same which shows that the random assignment of the groups were quite successful.

However the positive changes of mean values (towards normal value) from pre to the post and adjusted post-test phases in resting systolic
blood pressure of circuit training group (pre=117.2333 to post=118.7333 and adjusted post-test=118.641) and aerobic fitness programme (pre=116.9 to post=119.233 and adjusted post-test=119.280) are observed. On the other hand, the negative change of mean value in systolic blood pressure of control group from pre to the post and adjusted post-test phases are observed, which indicate the significant effect of aerobic fitness and circuit training programmes on systolic blood pressure of aerobic fitness and circuit training groups of secondary school girls.

Further the greater significant effect of aerobic fitness programme on systolic blood pressure is noticed in comparison to the circuit training programme.

Therefore from such effect it may be assumed that although both the aerobic fitness and circuit training programmes are having positive significant effect on systolic blood pressure, yet the effect of aerobic fitness programme is assumed to be greater than that of circuit training programme.

This study is in consonance with the findings of Larry G. Shaver.36

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36 Shaver, Essentials of Exercise Physiology, pp. 106-269.
Statement of Hypothesis

The hypothesis stated earlier in introductory chapter in respect to significant differences in resting systolic blood pressure among circuit training, aerobic fitness and control groups in pre, post and adjusted post-test phases are accepted as no significant differences in resting systolic blood pressure among the aforesaid groups in pre, post and adjust post-test phases are observed.

Resting Diastolic Blood Pressure

To investigate the existence of significant difference of diastolic blood pressure among circuit training, aerobic fitness and control groups the analysis of co-variance was applied which is presented in Table 31. The same is also graphically represented in Figure 16.
## TABLE 31
ANALYSIS OF CO-VARIANCE OF THE MEANS OF TWO EXPERIMENTAL GROUPS AND THE CONTROL GROUP IN RESTING DIASTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th>Mean</th>
<th>Circuit Training</th>
<th>Aerobic Fitness</th>
<th>Control Group</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Sum of Square</th>
<th>F- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test Means</td>
<td>69.5</td>
<td>69.5</td>
<td>69.66667</td>
<td>A</td>
<td>0.556</td>
<td>2</td>
<td>0.278</td>
</tr>
<tr>
<td></td>
<td>W 4181.667</td>
<td>87</td>
<td>48.065</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Test Means</td>
<td>74.83333</td>
<td>76.46667</td>
<td>75.4</td>
<td>A</td>
<td>41.267</td>
<td>2</td>
<td>20.633</td>
</tr>
<tr>
<td></td>
<td>W 1006.83</td>
<td>87</td>
<td>11.573</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted Post-Test Means</td>
<td>74.856</td>
<td>76.490</td>
<td>75.354</td>
<td>A</td>
<td>42.058</td>
<td>2</td>
<td>21.029</td>
</tr>
<tr>
<td></td>
<td>W 279.900</td>
<td>86</td>
<td>3.255</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.

F=0.05 (2.87) 3.10  A-Among Means Variance
F=0.05 (2.86) 3.10  W-Within Group Variance
FIGURE. 16. COMPARISON OF RESTING DIASTOLIC BLOOD PRESSURE AMONG CIRCUIT TRAINING, AEROBIC FITNESS AND ONE CONTROL GROUP IN PRE, POST AND ADJUSTED POST TEST MEANS.
Table 31 and Figure 16 clearly indicates no significant 'F' ratio of 0.006 for the pre-test and 1.783 for the post-test.

However, the 'F' ratio for the adjusted post-test mean reveal a value of 6.461 which is found to be significant for being greater than the required 'F' ratio value of 3.10 to be significant at 0.05 level of confidence. This indicates that there is significant difference for the adjusted post test mean of circuit training, aerobic fitness and control groups in resting diastolic blood pressure.

As the significant difference in the adjusted post-test means of resting diastolic blood pressure among circuit training, aerobic fitness and control groups is noticed. Further in order to find out the existence of significant difference, if any, between paired group means the post hoc test was computed which is presented in Table 32.
<table>
<thead>
<tr>
<th>Aerobic Fitness Group</th>
<th>Control Group</th>
<th>Circuit Training Group</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic Fitness Group</td>
<td>76.490</td>
<td>74.856</td>
<td>1.634*</td>
<td>0.921</td>
</tr>
<tr>
<td>Control Group</td>
<td>75.354</td>
<td>74.856</td>
<td>0.498</td>
<td>0.921</td>
</tr>
<tr>
<td>Circuit Training Group</td>
<td>76.490</td>
<td>---</td>
<td>1.136*</td>
<td>0.921</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.
Table 32 of paired group mean differences indicates the significant difference between circuit training and aerobic fitness groups and between aerobic fitness and control groups.

On the other hand no significant difference between circuit training and control groups is found.

**Discussion of Findings**

Table 31 and Figure 16 clearly indicates no significant differences in resting diastolic blood pressure in pre and post-test phases among circuit training, aerobic fitness and control groups. The mean values of aforesaid groups in pre-test phase are found almost the same (69.5, 69.5 and 69.66 respectively), which clearly indicate that the random assignment of the groups was quite successful.

Further from the pre to the post-test phases positive changes in the mean values (towards normal value) of two experimental groups are observed, which indicate the significant effect of circuit training and aerobic fitness programmes on resting diastolic blood pressure. From such changes it may be assumed that circuit training and aerobic fitness training programme is helpful in maintaining the normal diastolic blood
pressure. However, such finding is applicable in the case of low diastolic blood pressure only.

The positive changes in the resting diastolic blood pressure from pre to post and adjusted post-test phases of control group is surprising and the reason is not properly understood. However, some unknown involvement with the physical activities of control group subjects might have resulted in such positive changes in mean value of diastolic blood pressure.

In Table 32 for paired group mean differences, the significant differences are observed between the circuit training and the aerobic fitness groups and between aerobic fitness and control groups.

In Table 31 the almost uniform mean values of diastolic blood pressure of circuit training, aerobic fitness and control groups are observed, but after 10 weeks circuit training and aerobic fitness programme it is clearly noticed that the level of diastolic blood pressure of aerobic fitness group raised significantly higher in the post-test phase than that of circuit training group. Thus it may be assumed that the aerobic fitness programme has greater significant effect on diastolic blood pressure than that of circuit training programme.
Further, from such findings it may also be assumed that such significant positive change in diastolic blood pressure of aerobic fitness group appears probably due to the more systematic, scientific and non-monotonous, music-oriented dancing movement of aerobic fitness programme. Although the aerobic fitness programme is strenuous in nature, yet as it was music-oriented and rhythmically designed, therefore the entire load of work is carried out by the subjects heartily in full swing. Probably because of such reason in comparison to the pre test phase the positives change of mean value in diastolic blood pressure of aerobic fitness group (closer to the normal value) in post-test phase is found than that of aerobic fitness and control groups.

This study is in consonance with the study of Gentry.\textsuperscript{37}

\textbf{Statement of Hypothesis}

The hypothesis stated earlier in introductory chapter in respect to significant differences in resting diastolic blood pressure among circuit training, aerobic fitness and control groups in pre as well as post-test

\textsuperscript{37}Gentry, \textit{Dissertation Abstracts International}, 3352-A.
phases are hereby accepted as no significant differences in aforesaid aspects are observed.

However the hypothesis stated earlier in respect to adjusted post-test phase is rejected as the significant difference in resting diastolic blood pressure among circuit training, aerobic fitness and control group in adjusted post-test phase is observed.