Chapter IV

ANALYSIS OF DATA AND RESULTS OF THE STUDY

Analysis of Data

The statistical analysis of sprint performance of four groups namely speed-strength dominated group (A), Speed-Endurance dominated group (B), Strength-Endurance dominated group (C) and Control Group (D); before and after the 10 weeks of training was done by applying Mean Difference Method ('t' ratio) to find out significant difference, if any, between the pre-test and post-test means of the groups.

The data was further treated using analysis of variance and covariance to find out which of the four groups resulted in most significant improvement.

Level of Significance

The level of significance chosen to study the significance of difference between means obtained by using Mean Difference Method and Analysis of variance and covariance was set at .05 level of confidence, which is considered adequate for the purpose of the study.
Findings

The significance of differences between the pre-test and post-test means for the three experimental groups (A, B, and C) and the Control group (D) in 100 metres sprint performance and their 't' ratios have been presented in Table 1.

TABLE 1
SIGNIFICANCE OF DIFFERENCE BETWEEN THE MEANS FOR THE THREE EXPERIMENTAL GROUPS AND CONTROL GROUP IN SPRINTING SPEED (100 Metre Sprint)

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test Mean (sec.)</th>
<th>Post-test Mean (sec.)</th>
<th>DM</th>
<th>$\sigma_{DM}$</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>13.52</td>
<td>12.78</td>
<td>.74</td>
<td>.1245</td>
<td>5.944*</td>
</tr>
<tr>
<td>B</td>
<td>13.265</td>
<td>12.845</td>
<td>.42</td>
<td>.1823</td>
<td>2.304*</td>
</tr>
<tr>
<td>C</td>
<td>13.375</td>
<td>13.02</td>
<td>.335</td>
<td>.1584</td>
<td>2.241*</td>
</tr>
<tr>
<td>D</td>
<td>13.405</td>
<td>13.4</td>
<td>.005</td>
<td>.1432</td>
<td>0.035</td>
</tr>
</tbody>
</table>

*Significant at .05 level of Confidence.

$t_{.05}(38) = 2.02$. 
The Table 1 indicates that 't' ratios of 5.944 for group A (Speed-Strength dominated group), 2.304 for group B (Speed-Endurance dominated group) and 2.241 for group C (strength - Endurance dominated group) were significant at .05 level of confidence, whereas a 't' value of 0.035 for group D (Control group) was not significant at the set level of confidence.

As all the three experimental groups show significant differences, the data are further treated using analysis of variance and covariance, to find out if there are significant differences among the groups. The analysis of variance and covariance have been presented in Table 2.
### TABLE 2

ANALYSIS OF VARIANCE AND COVARIANCE OF THE MEANS FOR THREE EXPERIMENTAL GROUPS AND CONTROL GROUP IN SPRINTING SPEED (100 Metres Sprint)

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Sum of square</th>
<th>df</th>
<th>Mean Square</th>
<th>'F' ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W= 17.4045</td>
<td></td>
<td>.2290</td>
<td></td>
</tr>
<tr>
<td>Post-test Means (sec.)</td>
<td>12.78</td>
<td>12.845</td>
<td>13.02</td>
<td>13.4</td>
<td>A=4.6464</td>
<td>3</td>
<td>1.5488</td>
<td>5.9115</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W=19.9135</td>
<td></td>
<td>.2620</td>
<td></td>
</tr>
<tr>
<td>Adjusted Means (sec.)</td>
<td>12.65</td>
<td>12.97</td>
<td>13.04</td>
<td>13.39</td>
<td>A=5.4418</td>
<td>3</td>
<td>1.8139</td>
<td>69.4981</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W=1.9547</td>
<td></td>
<td>.0261</td>
<td></td>
</tr>
</tbody>
</table>

N= 80
A= Among the Group variance
W= With-in the Group variance.  

\[ F_{.05} (3, 76) = 2.73 \]
The pre-test means for the three experimental groups (A, B and C) and the Control group (D) are 13.52, 13.265, 13.375, and 13.405 respectively. The resultant 'F' ratio of .9598 is not found to be significant, indicating that there was no initial difference among the groups. The post-test means of 12.78, 12.845, 13.02 and 13.4 for the groups A, B, C and D respectively, yielded an 'F' ratio of 5.9115 which was found to be significant at .05 level of confidence. The differences between the adjusted final means of 12.65, 12.97, 13.04 and 13.39 for the three experimental groups (A, B and C) and the Control Group (D) respectively is also found to be significant, as the obtained 'F' ratio is 69.4981. The 'F' ratio needed for significance at .05 level of confidence is 2.73.

Since the 'F' ratio is found to be significant for the adjusted final means, the Scheffe's Test was applied to find out which of the differences between the paired adjusted final means are most significant. Differences between the paired adjusted final means have been presented in Table 3.
### TABLE 3

**Paired Adjusted Final Means and Differences Between Means**

For the three experimental groups and the control group in sprinting speed

(100 Metres Sprint)

<table>
<thead>
<tr>
<th>MEANS A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>DM</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.65</td>
<td>12.97</td>
<td></td>
<td></td>
<td>.32*</td>
<td>.103</td>
</tr>
<tr>
<td>12.65</td>
<td></td>
<td>13.04</td>
<td></td>
<td>.39*</td>
<td>.103</td>
</tr>
<tr>
<td>12.65</td>
<td></td>
<td></td>
<td>13.39</td>
<td>.74*</td>
<td>.103</td>
</tr>
<tr>
<td>12.97</td>
<td>13.04</td>
<td></td>
<td></td>
<td>.07</td>
<td>.103</td>
</tr>
<tr>
<td>12.97</td>
<td></td>
<td>13.39</td>
<td></td>
<td>.42*</td>
<td>.103</td>
</tr>
<tr>
<td>13.04</td>
<td></td>
<td>13.39</td>
<td></td>
<td>.35*</td>
<td>.103</td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.
From Table 3 it is clear that there is significantly greater improvement in the case of Group A (Speed-Strength dominated group). Then that of Group B (Speed-Endurance dominated group) and Group C (Strength-Endurance dominated group) (DM = .32 and .39). The improvement for Group B and C is identical as the paired mean difference is .07. At the same time all the experimental groups showed significant improvement over group D (Control Group) as the paired mean differences between groups A-D, B-D and C-D are .74, .42 and .35 respectively which are significantly higher than that of critical interval of 1.03. The comparison of means have been graphically represented in Figure 1.

Discussion of Findings

To become a good sprinter one must possess explosive strength, speed, endurance and extensibility besides technical perfection and strong determination. These factors can be developed through a systematic programme of training. When an athlete trains with proper and adequate load, adaptation of the morphological and physiological systems take place which in turn improves anaerobic and aerobic capacities which are mainly responsible for improvement of speed performance. The
Fig. 1. Comparison of the means for the three experimental and the control group in sprint performance.

- Group A
- Group B
- Group C
- Group D

Y-axis

1 cm = 2 Seconds
training loads namely, Speed-Strength, Speed-Endurance and Strength-Endurance employed in the study lay stress on development of both aerobic and anaerobic capacity which are basis for enhancement of performance in sprinting speed.

The anaerobic changes resulting from training are muscular hypertrophy, increased myofibrills, increase in protein particulates Actin and Myosin both in quality and quantity; improved Glycolytic system and increase in phosphogen (ATP-CP) system which results in improvement of power and speed of the organism. On the other hand the aerobic modifications bring about rapid oxidation of Carbohydrates (Glycogen) and delay lactic acid accumulation which in turn prevents fatigue and improves cardio-respiratory efficiency.

The anaerobic adaptations improve the stride length as a result of improved muscular strength and contractability of the muscles. On the other hand the aerobic adaptations will maintain the frequent leg movement over the entire distance of the race. Therefore, the observed improvement in sprinting performance in cases of all the experimental groups viz. Speed-Strength dominated group, Speed-Endurance dominated group and
Strength-Endurance dominated group can be attributed to the above reasons.

The analysis of data revealed that the group trained with Speed-Strength dominated training load improved most significantly in 100 metres sprint performance when compared with the groups trained with Speed-Endurance dominated and Strength-Endurance dominated training loads. This may be due to the fact that Speed and Strength loads cause most beneficial changes in the morphological and functional systems anaerobically which are vital for sprinting.

Therefore, the hypothesis stated earlier is accepted in case of Speed-Strength dominated training load group and rejected in case of Speed-Endurance dominated and Strength-Endurance dominated training load groups.

The results of the study are in consonance with the findings of Kusintz¹, Paish²,


²Paish, *Track Technique* 56 (June 1974): 1797.
Thomas³, Roy⁴, Dintiman⁵, Heighton⁶, Rynda⁷.


Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Sprinting Speed has varied applications in the field of Games and Sports, particularly in short distance races and horizontal jumps. Even though in long distance races endurance is a dominant component yet speed is a vital factor in winning.

In the present study the investigator felt the need to investigate the effectiveness of different combined training loads i.e., loads dominated by Speed-Strength, Speed-Endurance and Strength-Endurance training on sprinting performance.

The subjects were 80 male sprinters from Bilthai Higher Secondary School and Panisagar High School, Panisagar, Tripura, selected on the basis of 100 metres sprint performance. The subjects were randomly divided into four groups namely group A (Speed-Strength dominated loads), group B (Speed-Endurance dominated loads), group C (Strength-Endurance dominated loads) and Control Group D.
The subjects belonging to the three experimental groups underwent training three times a week that is on Mondays, Wednesdays and Fridays for a period of ten weeks. No specific training was imparted to Control Group D.

Test in 100 metres sprint performance was administered to the subjects of all the four groups before and after the experimental period of 10 weeks. Performance in 100 metres was recorded to the nearest 1/10th of a second.

The data was analysed with the help of 't' test, analysis of variance and covariance. The level of significance was set at .05 level of confidence. The statistical analysis of data revealed that all the three experimental groups improved significantly in sprinting performance (t = 5.944 for group A, t = 2.304 for group B and t = 2.241 for group C and F = 69.4981). Group A proved to be superior to Groups B and C in sprinting speed.

**Conclusions**

Within the limitations of the present study, the following conclusions may be drawn:

1. All the three training loads, i.e., loads
dominated by Speed-Strength, Speed-Endurance and Strength-Endurance are effective in improving sprinting speed performance of Secondary School Boys.

2. Training loads dominated by Speed-Strength proved to be most effective in developing sprinting speed.

3. Training loads dominated by Speed-Endurance and Strength-Endurance have been found to be equally effective in improving sprinting speed performance.

4. Absence of improvement in the case of Control Group could be a reflection of inactivity.

Recommendations

In the light of conclusions drawn, the following recommendations can be made.

1. Teachers of Physical Education and Coaches should use combined loads of training dominated by Speed-Strength, Speed-Endurance and Strength-Endurance for the development of Sprinting Speed.

2. To gain maximum benefits in sprinting speed, the teachers of Physical Education and Coaches must programme their training schedule with an emphasis on Speed-Strength dominance.
3. A similar study may be pursued by involving athletes of different proficiency levels and using specific loads of training which could be favourable for their optimum adaptation to sprinting speed, and other Physical and Physiological variables.

4. A similar study may be undertaken by involving different training schedules which have not been employed in the present study.

5. A similar study may be replicated to study the effects of combined loads of training on other sprinting events.

6. The present study may be repeated with subjects of age and sex other than those employed in the study.