Chapter IV

STATISTICAL ANALYSIS OF DATA AND RESULTS OF THE STUDY

Analysis of Data

The statistical analysis of data\textsuperscript{1} on aerobic and anaerobic performances and body composition of non-sports women belonging to different regions of India has been presented in this chapter. The data was statistically analysed by applying one-way Analysis of Variance (F-ratio) for each variable separately. Scheffe's Test of post-hoc significance was used to assess the significant difference between the paired means. The procedure of computing as given by Clarke and Clarke\textsuperscript{2} has been used. The F-ratios obtained by one way analysis of variance were tested for significance at the .05 level of confidence.

In one-way Analysis of Variance tabulated $F_{0.05}$ (df 3 and 496) for significant differences between stages is equal to 2.62.\textsuperscript{3}

Findings

Findings pertaining to aerobic, anaerobic and body composition were subjected to analysis of variance and mean difference method have been given below:

\textsuperscript{1} Data Presented in Appendices A, B and C.


\textsuperscript{3} ibid., p. 139.
Aerobic Performances

The aerobic performances of subjects were measured by applying Cooper's 8 Min. Run/Walk Test. The scores of subjects belonging to different regions of India were compared by applying one-way Analysis of Variance which are presented in Table 2.

**TABLE 2**

**ANALYSIS OF VARIANCE OF THE MEAN DIFFERENCES OF AEROBIC PERFORMANCE**

<table>
<thead>
<tr>
<th>Aerobic Performance</th>
<th>Sources of Variance</th>
<th>df</th>
<th>Sum of square</th>
<th>Mean square</th>
<th>'F' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper's 8 min. Run/Walk</td>
<td>Between Groups</td>
<td>3</td>
<td>1332380</td>
<td>444126.667</td>
<td>13.216*</td>
</tr>
<tr>
<td>Test</td>
<td>Within Groups</td>
<td>496</td>
<td>16668040</td>
<td>33604.919</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.

\[ F_{.05}(3, 496) = 2.62. \]

Table 2 reveals that there were significant differences in aerobic performance among different regions of India. To be significant at .05 level, the value required is 2.62 where as the obtained value is 13.216 which is much higher than the required value.

As the F-ratio was found significant in ease of aerobic performance the Scheffe's Post-hoc Test was applied to test the significance of differences between paired means separately among non-sports women belonging to different regions of India which
is presented in Table 3.

**TABLE 3**

SIGNIFICANCE DIFFERENCES BETWEEN THE PAIRED MEANS OF AEROBIC PERFORMANCE AMONG NON-SPORTS WOMEN BELONGING TO DIFFERENT REGIONS OF INDIA

<table>
<thead>
<tr>
<th>Northern Region</th>
<th>Southern Region</th>
<th>Eastern Region</th>
<th>Western Region</th>
<th>M.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1308.0</td>
<td>1237.6</td>
<td></td>
<td></td>
<td>70.4^a</td>
</tr>
<tr>
<td>1308.0</td>
<td>1166.4</td>
<td></td>
<td></td>
<td>141.6^a</td>
</tr>
<tr>
<td>1308.0</td>
<td>1266.4</td>
<td></td>
<td></td>
<td>41.6</td>
</tr>
<tr>
<td>1237.6</td>
<td>1166.4</td>
<td></td>
<td></td>
<td>71.2^a</td>
</tr>
<tr>
<td>1237.6</td>
<td>1266.4</td>
<td></td>
<td></td>
<td>28.8</td>
</tr>
<tr>
<td>1166.4</td>
<td>1266.4</td>
<td></td>
<td></td>
<td>100.0^a</td>
</tr>
</tbody>
</table>

^aSignificant at .05 level of confidence.

The limit of confidence interval at .05 level is

I (.05) = 60.752.

From the above Table 3, it is seen that there were significant differences of aerobic performance in favour of the results obtained between Northern and Souther regions, Northern and Eastern regions, Southern and Eastern region and Eastern and Western regions respectively at .05 level of confidence. (Fig. 1)

But in case of Northern and Western regions and Southern and Western regions differences were not found significantly.
Fig. 1. Comparison of Mean Differences in Aerobic Performances.

North
South
East
West
### TABLE 4

**ANALYSIS OF VARIANCE OF MEAN DIFFERENCES OF ANAEROBIC PERFORMANCE**

<table>
<thead>
<tr>
<th>Anaerobic Performance</th>
<th>Sources of Variance</th>
<th>df</th>
<th>Sum of square</th>
<th>Mean square</th>
<th>'F' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 M. Dash</td>
<td>Between Groups</td>
<td>3</td>
<td>27,464</td>
<td>9.155</td>
<td>31.246*</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>496</td>
<td>146.963</td>
<td>0.293</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.

\[ F_{.05}(3, 496) = 2.62. \]

Table 4 showed that there were significant differences in anaerobic performance among non-sports women belonging to different regions of India. As obtained 'F' ratio of anaerobic performance is 31.246 which is much higher value than the value 2.62 required for F-ratio to be significant at .05 level with 3, 496 degree of freedom.

As the F-ratio was found significant in the case of anaerobic performance the Scheffe's Post-hoc Test was applied to test the significance of difference between paired means separately. Among non-sports women belonging to different regions of India which is presented in Table 5.
TABLE 5
SIGNIFICANT DIFFERENCES BETWEEN THE PAIRED MEANS OF ANAEROBIC PERFORMANCE AMONG NON-SPORTS WOMEN BELONGING TO DIFFERENT REGIONS OF INDIA

<table>
<thead>
<tr>
<th>Northern Region</th>
<th>Southern Region</th>
<th>Eastern Region</th>
<th>Western Region</th>
<th>M.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.282</td>
<td>7.685</td>
<td>8.047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.282</td>
<td>7.777</td>
<td>8.047</td>
<td>0.597&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>7.685</td>
<td>8.047</td>
<td>7.777</td>
<td>0.235&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>7.685</td>
<td>8.047</td>
<td>7.777</td>
<td>0.505&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>8.047</td>
<td>7.777</td>
<td>0.362&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence

The limit of confidence Interval at .05 level is

I (.05) = .0179.

Table 5 shows that there were significant differences in most of the paired means at .05 level against the computed confidence interval 0.179. There were significant differences between the northern and southern regions, northern and eastern regions, northern and western regions, southern and eastern regions, and eastern and western regions. But in between southern and western regions difference was not found significant. (Which has been presented in Fig. 2).
Fig. 2. Comparison of Mean Differences in Anaerobic Performances.
TABLE 6

ANALYSIS OF VARIANCE OF THE MEAN DIFFERENCES
OF BODY COMPOSITION

<table>
<thead>
<tr>
<th>Body Composition</th>
<th>Sources of Variance</th>
<th>df</th>
<th>Sum of square</th>
<th>Mean square</th>
<th>'F' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Body Fat</td>
<td>Between Groups</td>
<td>3</td>
<td>509.382</td>
<td>169.794</td>
<td>78.318*</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>496</td>
<td>1075.363</td>
<td>2.168</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level of confidence.

\[ F_{0.05} (3, 496) = 2.62. \]

Table 6 shows that there were significant differences in body composition among non-sports women belonging to different regions of India. As obtained F-ratio of body composition is 78.318 which is much higher value than the value 2.62 required for F-ratio to be significant at .05 level with (3, 496) degree of freedom.

As the F-ratio was found significant in the case of body composition, the Scheffe's Post-hoc test was applied to test the significance of difference between the paired means separately among non-sports women belonging to different regions of India which is presented in Table 7.
TABLE 7

SIGNIFICANCE OF DIFFERENCES BETWEEN THE PAIRED MEANS OF BODY COMPOSITION AMONG NON-SPORTS WOMEN BELONGING TO DIFFERENT REGIONS OF INDIA

<table>
<thead>
<tr>
<th>Northern Region</th>
<th>Southern Region</th>
<th>Eastern Region</th>
<th>Western Region</th>
<th>M.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.191</td>
<td>22.605</td>
<td>23.487</td>
<td>24.656</td>
<td>2.586^a</td>
</tr>
<tr>
<td>25.191</td>
<td>23.487</td>
<td>24.656</td>
<td>1.704^a</td>
<td></td>
</tr>
<tr>
<td>22.605</td>
<td>23.487</td>
<td>24.656</td>
<td>0.882^a</td>
<td></td>
</tr>
<tr>
<td>22.605</td>
<td>24.656</td>
<td>2.051^a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.487</td>
<td>24.656</td>
<td>1.169^a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^aSignificant at .05 level of confidence.

The limit of confidence interval at .05 level is 1 (.05) = 0.488.

From the above Table 7 it is clear that there were significant differences of body composition in all the cases, namely between the northern and southern regions, northern and eastern regions, northern and western regions, southern and eastern regions, southern and western regions, and eastern and western regions at .05 level of confidence. (Which has been shown in Fig. 3).
Discussion of Findings with Regard to Aerobic Performance

Aerobic (oxygen) performance is generally characterized by muscular contraction of large muscle groups for an extended period of time, during which maximum cardio-respiratory adjustments were necessary since aerobic performance refers to the ability of the muscles to work efficiently. Oxygen is required to provide oxygen and nutrients to the working tissues, and to remove waste products of the metabolism.

Fig. 3. Comparison of Mean Differences in Body Composition.

![Bar Chart]

- **North**
- **South**
- **East**
- **West**

*Shaffer, Essentials of Exercise Physiology, p. 267.*
Discussion of Findings

The findings regarding aerobic and anaerobic performance and body composition belonging to different regions of India have been presented below:

Discussion of Findings with Regard to Aerobic Performances

Aerobic (with oxygen) performance is generally characterized by moderate contractions of large muscle groups for an extended period of time, during which maximum cardio-respiratory adjustments are necessary since aerobic performance refers to the ability of the heart, muscular systems and lungs to provide oxygen and nutrients to the working tissues and the remove waste products of the metabolism.⁴

It was observed that there were significant differences in aerobic performances between the northern and southern regions of India. Athletes from the northern region consume more wheat (which provides carbohydrates), green vegetables and enough fats. Probably one of the reasons of superiority in long distance running or aerobic type of activities could be due to consumption of fats which gives extra fuel by the release of free fatty acids

⁴Shaver, Essentials of Exercise Physiology, p. 267.
from the fat deposits during endurance type of activities.\textsuperscript{5}

Northern region did better in aerobic performance than that of other regions, the reason might be its hot and dry environment. Even though the temperature is high but the relative low humidity considerably reduces the heat stress because evaporation of sweat is more efficient.\textsuperscript{6} It is common knowledge that sweating is an affective cooling mechanism.

Significant differences were found in aerobic performance in case of eastern and western regions. Probably, the region could be food habits, climatic conditions i.e. eastern regions being hot and humid and western region having good climatic conditions throughout performance was effected greatly. This could be due to geophysical differences regarding the availability of the open space per capita.

It was further observed that there were significant differences in case of southern and eastern regions of India. It could be due to heredity and interest of the individuals to participate in long distance running.

From the findings it was observed that no significant diff-

\textsuperscript{5} Reena Singh Dev, "A Survey of Dietary Habits in Relation to Performance of Athletes Belonging to Different Regions of India" (Unpublished Master's Thesis, Jiwaji University, 1986).

\textsuperscript{6} Mathews and Fox, The Physiological Basis of Physical Education and Athletes, p. 464.
erences were found in aerobic performances of non-sports women belonging to northern and western regions and southern and western regions of India. It can be analysed that the overall population of the subjects in this study, then at least some subjects who have migrated to one region to another in a span of 5 years or more are there. Probably, these subjects were considered in a particular region but they actually representing different regions. During seven years or more of exposure the entire physio-chemical characteristics of an individual can not be changed by an alternate environmental influence. Probably, this could be the reason which contributed to same unusual observation in this study.

**Discussion of Findings with regard to Anaerobic Performances**

Anaerobic (without oxygen) performance is generally characterized by strong contractions from activities that require energy at such rates from the break-down of the ATP-PC and anaerobic glycolysis systems that aerobic metabolism cannot probably provide.  

There were significant differences of anaerobic performance of non-sports women belonging to northern and southern regions of India. This could be due to the fact that the people of the southern region consume more rice which provides sufficient carbohydrates Glycogen), fish (which provides better proteins). This

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7 Shaver, Essentials of Exercise Physiology, p. 276.
could be one of the reasons in dominance in sprint events which might be due to the glycogen which provides fuel and energy for anaerobic type of activities. Moreover, this extra protein probably help them to develop higher lean body mass (which is also evident from the observation that the non-sports women of the southern region have least fat percentage.

Other regions for East and South Indian women better in anaerobic type of activities and not in aerobic type of activities is due to the hot and humid environments. Increased humidity imposes a heat loss barrier to the evaporative mechanism by decreasing the vapour pressure gradient between the moisture in air and sweat on the skin. Such a heat loss barrier severely limits the capacity for work. Hence, this generally accounts for the discomfort people usually witness while exercising for a longer duration in warm and humid climate.

Significant differences were observed in anaerobic performances of non-sports women in the northern and eastern region, northern and western region, southern and eastern region and eastern and western regions. As it was known that for anaerobic work the following contributing factors which influence are:

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9 Shaver, Essentials of Exercise Physiology, p. 141.
Muscle types, (ii) Neuro-muscular Coordination, (iii) Velocity of nerve conduction, (iv) Reaction time, (v) Stride length, and as the subjects were chosen for the study were from different regions; they were having different anthropometric ratings and probably genetic make-up of muscles were not identical; and the food habits with wide variety of dietary intake and also varying interest towards sports and physical activities, the above observations were made.

No significant difference was found in aerobic performance of non-sports women belonging to southern and western regions. For this, the research scholar does not find a logical argument to explain the above phenomena. Therefore, more in depth study required in this connection, so that some scientific reasons can be provided for such offbeat observation.

Discussion of Findings with Regard to

Body Composition

From the findings with regard to body composition it was found that there were significant differences among non-sports women belonging to different regions (north, south, east and west) of India. It may be due to the selective dietary habits, different genetic factors related to adiposity. Moreover, the variation in the quanta of participation in physical activities were different in each group, thereby attributing differentially so far as fat reducing ability and physical activity of sports were concerned.
North Indian women having the more fat deposits used for the aerobic type of training and also for the throwing events, specially shot put and discuss throw, when the object is thrown forward and upwards, an equal and opposite reaction force is exerted on the athlete, pushing him backwards and downwards. Hence, weight here helps a lot.

More lean body mass is required for events like jumping, volleyball, basketball, pole vault and goal keeping. Hence, the eastern and southern region are found more suitable for such activities. Moreover, each region has its own liking for its particular societal taboos. If such activities are considered in relation to that concerned region obviously, their performance are bound to influence profusely, eventhough they might have some shortcomings in the physical and physiological variables, contributing to that performance. For example girls and boys from west bengal like swimming and football, girls from southern region are known as best sprinters in the country, girls from the northern region like long distance running and girls from western region are good in badminton.

At the beginning of the study it was hypothesised that the non-sports women belonging to different regions of India will exhibit significant differences in aerobic and anaerobic performance and body composition. The findings of this study as discussed in this chapter clearly support the hypothesis.