CHAPTER-V
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS
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The poor performance of Indian Athletes at the international level has been a cause of great concern, especially to the coaches, physical educationists and sports scientists. Efforts have been made to improve the standard of our sportsmen for a long time, but little success has been achieved, so far, in this respect.

Body structure plays a very significant role in determining human movements. Structural variations in body segments affect its movements. A specific type of body structure predisposes human body to advantage in a specific type of movement. The segmental length and breadth determine the leverage, possessed by the body (position of fulcrum and various lengths of load and efforts arms), which, in turn, affects the final outcome of force, created by muscles and its ultimate exploitation, for the purpose of motions.

This study was an attempt to highlight physical and physiological differences among elite middle and long distance runners of our country. The aim of this study was to compare the selected physical and physiological parameters of elite middle and long distance runners.

For the purpose of this study 50 Indian elite male middle and long distance runners were selected from

- India camp held at Patiala - Data of 7 athletes of 800 m runners, 9 athletes of 1500 – 5000 m runners and 10 athletes of 5000 – 10000 m runners were collected from 14\textsuperscript{th} May to 24\textsuperscript{th} May 2005.
- All India Inter-varsity, held at Ranchi - Data of 3 placeholder athletes of 800 m runners, 4 placeholder (1 athlete of previous year) athletes of 1500 – 5000 m runners and 4 placeholder (1 athlete of previous year) athletes of 5000 – 10000 m runners were collected from 25\textsuperscript{th} Jan to 1\textsuperscript{st} Feb 2004.
The study was delimited to the following physical and physiological parameters.


Physiological parameters: 1) Heart rate, 2) Vital capacity.

The researcher had gone to various parts of India for gathering the relevant data, all standards equipments and techniques were used.

F - test and scheffe's test at 0.05 level of significance were used to find out the significant difference among 800 m, 1500 - 5000 m and 5000 - 10000 m runner groups.

Results of the statistical analysis shows significant F - value for weight = 49.89, stature = 22.40, sitting height = 4.70, shoulder breadth = 5.93, hip breadth = 20.63, upper arm length = 38.09, fore arm length = 10.48, thigh length = 21.61, lower leg length = 25.69, biceps muscles girth = 10.76, calf muscles girth = 4.96, sum of five skin fold = 12.01, endomorphic rating = 3.71, mesomorphic rating = 10.84, ponderal index = 14.25, thigh length – lower leg length index = 22.28, hip breadth – stature index = 9.25, heart rate = 12.91 and vital capacity = 3.97
However insignificant F – value were obtained for humerus biepic condyle diameter, femur biepic condyle diameter, ectomorphic rating, sitting height – stature index, upper arm length – lower arm length index and shoulder breadth – stature index.

F – Value required for significance at .05 level of confidence was 3.20

Further, scheffe’s test analysis indicated that the 800 m runners’ mean weight, stature, hip breadth, upper arm length, fore arm length, thigh length, lower leg length, sum of five skin fold, thigh length – lower leg length index, hip breadth – stature index and heart rate were significantly greater than 1500 – 5000 m runners and 800 m runners’ mean ponderal index was lesser than 1500 – 5000 m runners.

However no differences were found between sitting height, shoulder breadth, biceps muscles girth, calf muscles girth, humerus biepic condyle diameter, femur biepic condyle diameter, endomorphic rating, mesomorphic rating, ectomorphic rating, sitting height – stature index, upper arm length – lower arm length index, shoulder breadth – stature index and vital capacity of 800 m and 1500 – 5000 m runners.

Scheffe’s test analysis indicated that the 800 m runners’ mean weight, stature, sitting height, shoulder breadth, hip breadth, upper arm length, fore arm length, thigh length, lower leg length, biceps muscles girth, calf muscles girth, sum of five skin fold, endomorphic rating, mesomorphic rating, thigh length – lower leg length index, hip breadth – stature index, heart rate and vital capacity were greater than 5000 – 10000 m and 800 m runners’ mean ponderal index was lesser than 5000 – 10000 m runners.

However no differences were found between humerus biepic condyle diameter, femur biepic condyle diameter, ectomorphic rating, sitting height – stature index, upper arm length – lower arm length index.
and shoulder breadth – stature index of 800 m and 5000 – 10000 m runners

Scheffe’s test analysis indicated that the 1500 - 5000 m runners’ mean upper arm length, lower leg length and mesomorphic rating, were greater than 5000 – 10000 m runners.

However no differences were found between mean weight, stature, sitting height, shoulder breadth, hip breadth, fore arm length, thigh length, biceps muscles girth, calf muscles girth, sum of five skin fold, humerus biepic condyle diameter, femur biepic condyle diameter, endomorphic rating, ectomorphic rating, sitting height – stature index, ponderal index, thigh length – lower leg length index, upper arm length – lower arm length index, hip breadth – stature index, shoulder breadth – stature index, heart rate and vital capacity of 1500 - 5000 m and 5000 – 10000 m runners

The reviews of various research studies in light of our findings is leading us to conclude that the observed significant differences in the various physical and physiological variables of elite middle and long distance runners are decisive determinants of the performance limits binding these athletes. This is conforming the fact that competitive sport demands event specific physical structure.

Top-level performance demands a particular type of body size, shape and proportion. Numerous researchers had observed high correlations between the body profile of athletes and performance in specific tasks. Hirata had suggested that Nation with people whose general physique is limited to the characteristics of champions in certain events must concentrate their training programme on those events only. Carter had also suggested that the athletes who wish to achieve success in sports at high level must compare their physique with Olympic athletes.

Thus the findings of this study will be useful to coaches in track and field. As hard empirical facts obtained could from the basis of talent
selection in the very field. It is also to be noted that not much empirical work has been done to study the physical and physiological differences between elite middle and long distance runners of India. This research had highlighted the physical and physiological characteristics of middle and long distance runners. It had also shown physique in relation to the mechanical requirement of the two categories of running events.

**CONCLUSIONS:**

The findings of our study had led us to draw the following conclusions:

**Physical variables:**

- 800 m runners’ had greater weight, stature, hip breadth, upper arm length, fore arm length, thigh length, lower leg length, sum of five skin fold, thigh length – lower leg length index and hip breadth – stature index than 1500 – 5000 m runners.

- 800 m runners’ had lesser ponderal index than 1500 -5000 m runners.

- No differences were found between sitting height, shoulder breadth, biceps muscles girth, calf muscles girth, humerus biepic condyle diameter, femur biepic condyle diameter, endomorphic rating, mesomorphic rating, ectomorphic rating, sitting height – stature index, upper arm length – lower arm length index and shoulder breadth – stature index of 800 m runners and 1500 – 5000 m runners.

- 800 m runners’ had greater mean weight, stature, sitting height, shoulder breadth, hip breadth, upper arm length, fore arm length, thigh length, lower leg length, biceps muscles girth, calf muscles girth, sum of five skin fold, endomorphic rating, mesomorphic rating, thigh length – lower leg length index and hip breadth – stature index than 5000 – 10000 m runners.
- 800 m runners’ had lesser ponderal index than 5000 – 10000 m runners.

- No differences were found between humerus biepic condyle diameter, femur biepic condyle diameter, ectomorphic rating, sitting height – stature index, upper arm length – lower arm length index and shoulder breadth – stature index of 800 m and 5000 – 10000 m runners

- 1500 – 5000 m runners’ had greater upper arm length, lower leg length and mesomorphic rating than 5000 – 10000 m runners.

- No differences were found between mean weight, stature, sitting height, shoulder breadth, hip breadth, fore arm length, thigh length, biceps muscles girth, calf muscles girth, sum of five skin fold, humerus biepic condyle diameter, femur biepic condyle diameter, endomorphic rating, ectomorphic rating, sitting height – stature index, ponderal index, thigh length – lower leg length index, upper arm length – lower arm length index, hip breadth – stature index and shoulder breadth – stature index of 1500 - 5000 m and 5000 – 10000 m runners.

**Physiological variables:**

- 800 m runners’ had greater heart rate than 1500 – 5000 m runners.

- No differences were found in vital capacity of 800 m and 1500-5000 m runners.

- 800 m runners’ had greater heart rate and vital capacity than 5000 – 10000 m runners.

- No physiological differences were found between 1500 - 5000 m and 5000 – 10000 m runners.
RECOMMENDATIONS:

1. The findings of the study should be taken into consideration while going for talent hunts for probable potential middle and long distance runners. Children with the inherited physical and physiological characteristics as observed in our study may only be recommended for middle and long distance running.

2. Along with physical and physiological parameters, psychological and biomechanical parameters of middle and long distance runners should also be studied.

3. Further, a study should be conducted to compare world elite middle and long distance runners in relation to physical, physiological, psychological and mechanical parameters.