Chapter V

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

Now-a-days there is a general awakening among the Coaches, Physical Education Teachers and the Trainees to the concept of optimum fitness for competitive participation in all levels. Many training programmes have been evolved to reach the goal among which the latest is aerobic and anaerobic training principles. For formulating specific training programmes in relation to aerobic and anaerobic training principles it is essential to avail the specific effects of these training in relation to cardio-respiratory response patterns against different stimulus (load) for assessing the cardio-respiratory status of their students or trainees in relation to demand of a particular game or activity.

The purpose of the study was to determine the effect of graded exercises on certain circulatory and respiratory variables among untrained, anaerobically trained and aerobically trained individuals.
Sixty male students in the age group of 15 to 17 years, studying in standard ten and eleven of the Scindya School, Gwalior Fort, residing in the same school hostel were utilised for the study. The subjects were selected at random using the lottery method and equally assigned to three groups of 20 each i.e., two experimental groups (Ae and An) and as a control group (Un). The two experimental groups participated in a training programme of twelve weeks, three days per week. For obtaining different trained groups, group Ae participated in an aerobic training programme involving two repetitions of 0.5 Km to 1 Km run within 15 minutes duration during the first two weeks. The load was increased in stages by increasing the distance of run by 0.5 Km, and other factors were kept constant. The recovery period was 10 minutes between the repetitions. Group An participated in aerobic training programme involving six repetitions of 80 m. runs during the first two weeks. The load was increased in stages. For the first eight weeks the volume of training was increased and other factors were
kept constant i.e. two repetitions were increased at the end of every two weeks. For the next four weeks the intensity of stimulus was increased by reducing the time run of each 80 m. to 13 and 15 sec. from 15 and 17 sec. at the ninth and tenth weeks respectively and so on. Thus, the volume of training was kept constant, by retaining 12 repetitions of 80 m. run.

After the preparation of different trained groups the data on selected circulatory and respiratory variables of heart rate, blood pressure, haemoglobin concentration, tidal volume, respiratory rate, minute ventilation at rest and at 60, 90, 120, 150 watts graded exercise levels; cardio pulmonary index at adynamic and dynamic stage and maximal oxygen uptake were recorded. The differences among the groups were analysed by one way analysis of variance (F Test) and the significance of the differences between the paired adjusted final means was analysed by applying Scheffe's post hoc test in these variables were F ratio was significant. The level of significance was set at .05.
Analysis of variance to find out differences among the groups, if any, resulted in significant F values at 0.05 level in heart rate, systolic blood pressure, haemoglobin concentration, tidal volume, and respiratory rate and minute ventilation at rest ($F=17.79$, 7.19.56, 16.65, 15.81 and 33.84 respectively) as well as at all the graded exercise levels ($F=15.38$, 7.68, 16.1, 6.37, 16.66, 13.91 respectively at 60 watts; 7.71, 30.21, 6.12, 9.23, 15.666, 16.76 respectively at 90 watts 18.96, 8.93, 9.5, 17.53, 14.66, 34.65 respectively at 120 watts; and 22.47, 8.43, 19.4, 22.65, 35.6 and 53.49 respectively at 150 watts graded exercise level). Significant differences were also noticed in diastolic blood pressure at 150 watts ($F=7.46$) graded exercise level; cardio pulmonary index, adynamic ($F=5.17$) and dynamic ($F=8$) stages and for maximal oxygen consumption ($F=22.32$). Diastolic blood pressure at rest at 60, 90 and 120 watts graded exercise levels did not yield significant F values.

The application of Scheffe's post hoc Test revealed that the mean gains made by the group Aa were
significantly lower than An in the case of heart rate, systolic blood pressure, tidal volume, respiratory rate and minute ventilation at rest as well as at all the grades of exercise level; and diastolic blood pressure at 150 watts graded exercise level and significantly higher in the case of haemoglobin concentration at rest and at all grades of exercise level, cardio-pulmonary index at adynamic and dynamic stage and maximal oxygen consumption.

The mean gains achieved by the group An was significantly lower than Un in the case of heart rate only at rest, at 120 and 150 watts; tidal volume at rest, at 120 and 150 watts; respiratory rate at rest as well as at all the grades of exercise level and minute ventilation at rest, at 60, 120 and 150 watts graded exercise levels; and higher in the case of haemoglobin concentration at rest, at 60 and 150 watts graded exercise level and maximal oxygen consumption.

The mean gains achieved by Ae was significantly lower than An in the case of heart rate at all the grades
of exercise level; systolic blood pressure at 90 and 150 watts, tidal volume and minute ventilation at rest, at 90, 120 and 150 watts graded exercise levels. However, it was significantly higher in haemoglobin concentration at 150 watts; cardio-pulmonary index at dynamic stage and maximal oxygen consumption.

Group Aa was found to give superior responses in circulatory and respiratory variables which got significant difference followed by group An and least by group Un.

Conclusions

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

1. Aerobically trained group appears superior to untrained group in bringing out significant differences in heart rate, systolic blood pressure, haemoglobin concentration, tidal volume, respiratory rate and minute ventilation at rest as well as at each grade of exercise level; diastolic blood pressure at 150 watts graded exercise level; cardio pulmonary index at
dynamic and adynamic stage and maximal oxygen consumption.

2. Aerobically trained group appears superior to Anaerobically trained group in bringing out significant difference in heart rate at all the graded exercise levels; haemoglobin concentration at 150 watts; tidal volume and minute ventilation at rest and at 90, 120 and 150 watts graded exercise levels; cardio pulmonary index at dynamic stage and maximal oxygen consumption.

3. Anaerobically trained group appears superior to untrained group in bringing out a significant difference in heart rate at rest and at 120 and 150 watts graded exercise level; systolic blood pressure at 90 watts graded exercise level; haemoglobin concentration at rest, at 60 and 150 watts; tidal volume at rest and at 120 and 150 watts graded exercise level; minute ventilation at rest and at 60, 120 and 150 watts graded exercise level respiratory rate at rest and at each grades of exercise level and maximal oxygen consumption.
4. Aerobically trained group and anaerobically trained group were not superior to untrained group in bringing out significant changes in diastolic blood pressure at rest and at 60, 90 and 120 watts graded exercise levels.

5. Anaerobically trained group does not appear superior to aerobically trained group in bringing out significant changes in any of the circulatory and respiratory variables.

6. Aerobically trained group is not superior to anaerobically trained group in heart rate at rest, systolic blood pressure at rest and at 60 and 120 watts, tidal volume at 60 watts and respiratory rate at rest as well as at each grade of exercise level.

7. Anaerobically trained group is not superior to untrained group in heart rate at 60 and 90 watts; systolic blood pressure at rest, 60, 120 and 150 watts; diastolic blood pressure at 150 watts; haemoglobin concentration at rest, at 60, 90, and 120 watts graded exercise level; Cardio Pulmonary Index at dynamic and
adynamic stage; tidal volume at 60 and 90 watts graded exercise level and minute ventilation at 90 watts graded exercise level.

Generalizing the inference, both of the trained groups appear superior in circulatory and respiratory responses than untrained group. Among the trained groups, the aerobically trained group appears superior, in all respects, than anaerobically trained group.

Recommendations

In the light of these conclusions, the following recommendations appear relevant.

1. The effectiveness of the aerobic training may be comparable in relation to other endurance development training means such as aerobic dancing, duration load method, circuit training etc. as to enable the teachers of physical education, coaches and students to use the best method of aerobic training.

2. On the advice of the specialist, aerobic training may be recommended for persons having cardiovascular problems as this training brings about, positive
changes in physiological variables associated with cardio-vascular fitness.

3. The present study may be undertaken with subjects of age and sex other than those employed in this study.

4. It may be repeated by selecting variables; viz., (1) those occurring at tissue level, that is biochemical changes (2) other changes such as those concerned with body composition, blood cholesterol and triglyceride levels, changes with respect to heat acclimatization and changes with respect to connective tissue etc.

5. It may also be repeated by selecting variables other than those employed in this study like psychological and sociological variables.