CHAPTER - V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

In these days of explosive population growth and advanced technology, considerable emphasis is being laid on educating the citizens to maintain optimum level of fitness for personal efficiency and national progress all over the world. The present day is an age of automation, sophistication and technologic wonders beyond man’s wildest dreams of years ago. Inspite of all the powerful and even increasing efforts on the part of medical science in resent years, to make man aware of the fact that preventive maintenance of his body and especially of his heart, is the only way to assure a long and healthy life of modern man has been observed.

Modern scientific approach to unveil the complex nature of sports performance has developed a number of branches in the vast field of sports science, a few of which are – sports pedagogy, sports psychology, sports sociology, sports statistics, training methodology in sports, Biomechanics, sports anthropometry and sports politics. Each of these branches having same goal to achieve, possesses its own angle of approach, areas of work, means and methods of experimentation.

The world of training methodology has crossed many mile stones as a result of different types of research works in general and their application to the sports development in particular. In the
modern scientific age, athletes are being trained by highly sophisticated means for better achievement in their concerned sports. They are being exposed to the exercises and training methods, which have proved beneficial for achieving higher standards. Much progress has been made in the recent years in the acquisition of knowledge about training means and techniques of sports skills. In sports training, specialized exercises are being prescribed for the fullest and optimum development for a particular game.

In spite of massive efforts on the part of Government of India, public sector undertaking, industrial concerns and sportsmen themselves, we have comparatively very little achievement to report in the field of sports at the international level. This lack of creditable performance may be due to a number of factors.

One such shortcoming may be the type of training methods employed by the coaches for preparing athletes under Indian conditions at different levels of competition while it is evident from the available literature that considerable research has been undertaken with regard to continuous running, interval running and fartlek or competition as methods of training, no attempt has been made to study the effects of combination of continuous & interval running method on performance of athletes specially Indian. Therefore, the investigator undertook the present study.

The purpose of the study was to compare the effects of continuous running, interval running and combination of continuous & interval running on selected anthropometrical, physical fitness and physiological variables on boys.
OBJECTIVES OF THE STUDY

The study had been focused to achieve the following objectives: -

1. To find out the effects of continuous running [Conditioning Program I] on anthropometrical, physical and physiological Variables.

2. To find out the effect of the interval running [conditioning program II] on anthropometrical, physical and physiological variables.

3. To find out the effect of combination of continuous [conditioning program I] and interval running [conditioning program II] on Anthropometrical, physical and physiological variables.

4. To know the comparative effects of continuous, interval and combination of continuous and interval training on anthropometrical, physical and physiological variables among school boys.

HYPOTHESES

The following were the hypotheses of the study: --

1. There would be significant effect of continuous, interval and combination of continuous and interval running on percentage of body fat of the school -boys.

2. There would be significant effect of continuous, interval and combination of continuous and interval running on body weight of the school boys
3. There would be significant effect of continuous, interval and combination of continuous and interval running on explosive leg strength of the school-boys.

4. There would be significant effect of continuous, interval and combination of continuous and interval running on speed of the school-boys.

5. There would be significant effect of continuous, interval and combination of continuous and interval running on agility of the school-boys.

6. There would be significant effect of continuous, interval and combination of continuous and interval running on abdominal strength endurance of the school-boys.

7. There would be significant effect of continuous, interval and combination of continuous and interval running on trunk flexibility of the school-boys.

8. There would be significant effect of continuous, interval and combination of continuous and interval running on resting heart rate of the school-boys.

9. There would be significant effect of continuous, interval and combination of continuous and interval running on respiration rate of the school-boys.
10. There would be significant effect of continuous, interval and combination of continuous and interval running on vital capacity of the school-boys.

11. There would be significant effect of continuous, interval and combination of continuous and interval running on Cardio-respiratory endurance of the school-boys.

SAMPLE

Eighty male students (ranging from 16-19 years) studying in grades Eleven and Twelve of Government Senior Secondary School Sector-27, Chandigarh were selected as subjects for the purpose of this study. The total number of students in these two grades was 256. To ensure that only untrained subjects were selected, 49 students who were undergoing strenuous physical training for participating in competitive sports on behalf of the school were eliminated from the list. For the remaining 207 students belonging to these two grades, a mixed exhaustive list was prepared indicating serial number, name, class and section. Finally 80 students were selected as subjects by using the simple random sample procedure.

The subjects were equally assigned to three experimental groups and one control group by using the simple random sampling procedure of drawing lots. All the three experimental groups participated in the training programme for a period of ten weeks. Exp. group-1 performed continuous running, exp.groups-2 performed interval running and exp.groups-3 trained with combination of...
continuous + interval running method. The control group was the fourth, which was not given any training.

TOOLS USED

Data were collected on the chosen variables at the pre and post experimental stage. The following test and tools were used to collect the data:

Anthropometrical Variables were used to assess the body composition of the subjects.

1. Percentage of body fat : To assessed with the help of skin fold caliper.
2. Body weights were :To measured using weighing Machine.

- Physical test was used to measure the following motor fitness ability of the subjects.

1. Standing Broad Jump :To measure explosive leg strength.
2. 50 Meters Dash :To measure speed.
3. 4 X 10 Meters Shuttle Run :To measure agility.
4. Sit-ups :To measure abdominal strength endurance.
5. Sit & Reach :To measure trunk flexibility.
Physiological tests were conducted with the following tools.

1. Resting Heart Rate. Stop Watch
2. Respiratory Rate. Stop Watch
3. Vital Capacity Spiro meter
4. 2.4 Kilometers Run (for Cardio-respiratory endurance) Stop Watch

STATISTICAL DESIGN

The significance differences between the pre-test and post-test means for each group were examined by applying the t-test (Clarke and Clarke, 1970).

To find out the significance of the differences among the groups as a result of training, the analysis of covariance was applied.

Since the study employed the random group design and the four groups were not equated with reference to the factors examined, through the analysis of covariance the final means were adjusted for differences in the initial means and he adjusted final means were tested for significance.

In the case of variables where the F-ratio (ANCOVA) was found significant, Scheffe's post-hoc test was applied to study the significance of the differences between the paired adjusted the final means.
The level of significance to check the ‘t’ values and ‘F’ ratios obtained by mean difference method and Analysis of covariance was set at .05 level, which was considered as appropriate and adequate for purpose of this study.

**FINDINGS OF THE STUDY**

The differences found significant in between the pre-test and post-test means of experimental groups in anthropometrical variable: percentage of body fat (exp. group-1, \( t = 4.07 \); exp. group-3, \( t = 2.42 \)). Was significant at .05 level.

Physical variables: standing broad jump (exp. group-2, \( t = 2.28 \)), 50m dash run (exp. group-2, \( t = 6.26 \); exp. group-3, \( t = 2.77 \)), 4 X 10m. Shuttle run (exp. group-2, \( t = 2.61 \)), sit-ups (exp. group-1, \( t = 2.67 \); exp. group-2, \( t = 3.59 \); exp. group-3, \( t = 3.77 \)), sit & reach (exp. group-1, \( t = 3.60 \); exp. group-2, \( t = 4.06 \); exp. group-3, \( t = 3.02 \)), were significant at .05 level.

Physiological variables: resting heart rate (exp. group-1, \( t = 10.45 \); exp. group-2, \( t = 8.33 \); exp. group-3, \( t = 5.06 \)), respiration rate (exp. group-1, \( t = 4.61 \); exp. group-3, \( t = 2.44 \)), vital capacity (exp. group-1, \( t = 8.27 \); exp. group-2, \( t = 6.10 \); exp. group-3, \( t = 7.84 \)); and 2.4 km run (exp. group-1, \( t = 4.38 \); exp. group-2, \( t = 3.89 \); exp. group-3, \( t = 4.15 \)) were significant at .05 level. The control group did not show any significant differences in the chosen variables.

The differences between pre-test and post-test mean scores of experimental groups were not found statistically significant in
anthropometrical variables: percentage of body fat (exp. group-2, t = 1.97), body weight (exp. group-1, t = 0.36; exp. group-2, t = 0.06; exp. group-3, t = 0.19). Physical fitness variables: standing broad jump (exp. group-1, t = 0.69; exp. group-3, t = 1.81), 50m dash run (exp. group-1, t = 1.18), 4 X 10 m. shuttle run (exp. group-1, t = 1.42; exp. group-3, t = 1.78) and physiological variables: respiration rate (exp. group-2, t = 1.81).

The analysis of covariance when applied to find out the significance of differences among the adjusted final means of the three experimental groups and control group, resulted in the significant ‘F’ value at .05 level in percentage of body fat (F = 28.20), standing broad jump (F = 9.46), 50 meters run (F = 41.68), 4 X 10 meters shuttle run (F = 6.74), sit-ups F = 25.79), sit & reach (F = 49.89), resting heart rate (F = 54.33), respiration rate (F = 15.25), vital capacity (F = 40.36) and 2.4 kilometers run (F = 46.44). All the above variables obtained F- ratios, which were higher than the value of 2.73, required for the F- ratio to be significant at .05 level.

As the analysis of covariance (F- ratios) showed significant differences among the groups in the variables of percentage of body fat, standing broad jump, 50m. Dash test, 4 X 10m shuttle run, sit-ups, sit & reach and the physiological variables; resting hear rate, respiration rate, vital capacity and Cardio-respiratory endurance, the Scheffe’s post-hoc test was applied to find which of the differences between means amongst the groups were statistically significant.

The results of Scheffe’s post-hoc test on anthropometrical variable that was percentage of body fat indicated that exp. group-1
which was exposed to continuous running have shown maximum reduction in body fat when compared exp. group-2, exp-group-3 and control group. Exp. group –2 and 3 also reduced their body fat significantly than control group. Ten weeks of training have produced significant reduction in body fat for experimental group-1 (CR) and experimental group-3 (C+IR). The experimental group-2 (IR) have also reduction in percentage of body fat but the value was less than required for significant ‘t’ value at .05 level. Whereas control group has not recorded any statistically significant reduction in percentage of body fat. The reduction in percentage of body fat in case of experimental group –1 (CR) was found to be most significant.

The body weight of all three experimental groups and control group did not change significantly after ten weeks of training

Experimental group-2 (IR) recorded significant development in explosive leg strength as a result of ten weeks of training. The improvement in case of experimental group-1, experimental group-3 and control groups were not significant.

The results of 50-m. dash test showed that speed improved significantly for the experimental group-2 (IR) and experimental group-3 (C+IR) as a result of ten weeks of training for the respective groups. However, the experimental group-1 and control group did not show any significant gain in speed. The improvement of speed in experimental group-2 (IR) is significantly greater as compared to other three groups.
After ten weeks of training only experimental group-2 had shown significant improvement in agility as measured by 4 X 10 meters shuttle run. Experimental group –1, experimental group-3 and control group did not show any significant improvement in agility.

The abdominal strength of all three experimental groups improved significantly as a result of ten weeks of training. The control group showed no change. The abdominal strength was significant greater in case of experimental group-3 than that of experimental group-1 and experimental group-2.

After ten weeks of training among different conditioning groups all three experimental groups have recorded significant increase in flexibility as measured by sit & reach test. Whereas, no significant improvement was noticed in the case of control group.

All three experimental groups registered improvement in resting heart rate due to ten weeks of training. The improvement in case of experimental group-1 was significantly greater than the experimental group-2 and experimental group-3. The control group shows no significant gain in resting heart rate even after the ten weeks.

The respiration rate of experimental group-1 and experimental group-3 improved significantly as a result of ten weeks of training. The experimental group-2 and control group shows not significant improvement in respiration rate. The respiration rate was significantly greater in case of experimental group-1 than that of experimental group- 3.
The vital capacity of all three experimental groups improved significantly as a result of ten weeks of training. The control group shows no change. Vital capacity was significant greater in case of experimental group-3 than that of experimental group-1 and experimental group-2.

All three experimental groups registered improvement in Cardio -respiratory endurance due to ten weeks of training. The improvement in case of experimental group-1 was significantly greater than the experimental group-2 and experimental group-3. The control group showed no significant gain in Cardio-respiratory endurance even after the ten weeks.

**CONCLUSIONS**

Within the limitations and delimitation imposed by the subjects and the experimental conditions, and based on the analysis of data, the following conclusions have been drawn: -

1. Continuous running and combination of continuous & interval running programme as employed in the study were significantly effective to reduced the percentage of body fat, whereas for interval running programme reduction was not significant.

2. None of the experimental groups could yield significant difference was observed on the anthropometrical variable body weight after ten weeks of experimental treatment.

3. Interval running was found to have produced significant improvement with regard to explosive leg strength, whereas no
significant improvement was found with regard to the continuous running and combination of continuous & interval running groups.

4. Interval running and combination of continuous & interval running programme were significantly effective in decreasing running time in speed (50 meters dash) whereas for continuous running effects with regard to the said variables no significant differences were observed.

5. Interval running programme was observed to have significant effect on agility (4 X 10 meters shuttle run) whereas continuous running and combination of continuous & interval running programmes had not shown significant difference on agility.

6. All the three experimental groups (continuous running, interval running and combination of continuous & interval running) were found significantly effective in improving abdominal strength (sit-ups), trunk flexibility (sit & reach), lowering resting pulse rate, developing Cardio-respiratory endurance and increasing vital capacity of school boys in the age group of 16 -19 years.

7. Continuous running and combination of continuous + interval running programme were found to be significantly effective for decreasing respiration rate, whereas for interval running the decrease in respiration rate was not found significant.
IMPLICATIONS OF THE STUDY

The findings of the present study have shown that continuous running and a combination of continuous & interval running were very effective training methods for achieving reduction in the percentage of body fat and respiration rate. These findings can be of immense value to the coaches, trainers and physical educationists who have to develop training programmes aimed at reducing percentage of body fat as well as improving the respiration rate.

It has been shown in the present study that for improving the explosive leg strength and agility, the interval running method was the best one as only this method has produced significant improvement in the explosive leg strength and agility. The coaches and trainers associated with school children can achieve maximum improvement in their trainers explosive leg strength and agility by subjecting them to interval running programme.

Interval running alone as well as in combination with continuous running has demonstrated improvement in running speed among the subjects of the present study. These finding will be of great help to the coaches and physical trainers who desire to improve running speed among their trainees.

The findings of the present study have demonstrated the effectiveness of continuous running, interval running as well as combination of both of these groups of running methods for improving abdominal strength endurance, trunk flexibility, resting heart rate, vital capacity and Cardio- respiration endurance. These
findings can be of great value to the coaches, physical trainers and physical education teachers who are associated with the training and coaching of such children. They will be able to achieve maximum benefits by effectively utilizing these types of running methods for improving the anthropometrical, physical and physiological abilities.

**RECOMMENDATIONS**

In the light of the results of the present study, the following recommendations may be suggested:

1. The study was conducted on 16 to 19 years of age group. The similar study may be conducted on subjects of different age groups.
2. A similar study may be conducted on female subjects.
3. A similar study may be undertaken by involving the athlete's of different proficiency levels using specific training programme, which could be favorable for their optimum adaptation to physical fitness variables.
4. A large number of samples may be taken in further studies to achieve more authenticity.
5. The psychological variables, which have not been included in this study, may be included in further studies to gain psychological understanding of the subjects, belonging to various experimental groups.
6. Through, present study was limited three experimental groups, more experimental group may be taken in further study.

7. The effects of detraining, which have been not included in this study, may be included in further studies to knowing to real effects of different conditioning programmes on the school-boys.