CHAPTER - II

Review of Related Literature
CHAPTER II
REVIEW OF RELATED LITERATURE

A study of relevant literature is an essential step to get a full picture of what was done with regard to the problem under study. Such a review brings about a deep and clear perspective of the overall field.

The relevant literature pertaining to the present study has been abstracted in this chapter to provide the background material to evaluate the significance of this study as well as to interpret its findings.

Amusa and Sohi\(^1\) conducted a study on twenty soccer players who were being prepared for the biennial Nigerian universities Games (NUGA) in 1980, before and after five months of training and compared them with a similar group of control subjects. Measurements were obtained on percent fat, lean body weight, height and on tests of muscular power, muscular strength, muscular endurance, speed, agility and cardiovascular endurance. Significant increase occurred in cardiovascular endurance, significant decrease occurred in body weight, body diameters and skinfolds, and appreciable gains were also recorded for muscular endurance.

It was concluded.

1. That changes in body composition and structural measures accompany endurance training and
2. That the primary training effects for soccer players were an increase in muscular endurance and cardiovascular endurance rather than an increase in either muscular strength or muscular power.

Keough studied the effects of a daily and two days per week physical education programme upon motor fitness of children. The IOWA test of motor fitness was administered to grade three and five students in two parochial schools before and after 20 well organised and varied physical education periods of 30 minutes duration. The children in the daily programme were also tested three and seven weeks after classes had been discontinued. The two periods per week programme appeared as effective as the daily programme of equal content and duration since significant gains in composite motor fitness resulted in both grades from the programmes. The composite and individual test mean gains showed little difference for boys and girls. Gains from

daily programme were maintained for at least seven weeks after participating was discontinued.

Selder conducted a study on anthropometric, cardiovascular and motor performance characteristics of university ice hockey players. Characteristics of physique, motor and cardiovascular fitness were reported for 14 varsity hockey players, some of whom represented Canada in the 1964 winter Olympics. Most of the players were dominant mesomorphs with low adipose measurements. It was found that the majority were above average in dips and in dynamometrical strength but average or below in other tests of motor fitness.

Hanson investigated the effect of three selected weight training programmes on muscular strength, endurance girth and cardiovascular endurance. He selected 30 freshmen and varsity football players from the 1968 South Dakota group and used a modification of the Delorme-Watkeins methods of training. The second group followed the

---


traditional strength training method, while the third followed a circuit training programme. Training covered a period of seven weeks, three times a week, and tests for muscular strength, endurance and girth training, and at the conclusion of the training programme, all groups significantly improved on all the parameters and there was no significant difference between the groups.

Jackson randomly assigned seven male college subjects to train at each of the following heart rate levels, 130, 145 and 160 beats per minute. The training programme consisted of 12 minutes of walking on the treadmill, four days per week for six weeks the resting heart rate, the heart rate response to two weeks tests (a treadmill test and a bicycle ergometer test), and the recovery heart rate from these two week tests were utilised as estimates of cardiovascular fitness. It was concluded that improvement in cardiovascular fitness is directly related to the heart rate training intensity and that training at an intensity of 145 beats per minute or higher is necessary to improve cardiovascular fitness.

5 Gray R. Jackson, "The Effect of Training at Three Different Heart Rate Levels upon Cardiovascular Fitness" Completed Research in Health, Physical Education and Recreation 10 (1968) : 113.
Mckibben⁶ in his study of the comparison of three work loads of varying intensities and distance on cardiorespiratory endurance divided the subjects into three groups, group one was trained at a rate of 150 beats per minute for fifteen minutes, group second was trained at a rate ranging from 120 to 180 beats per minute for fifteen minutes, group third was trained at a rate of 150 beats per minute over a distance run by group second and the subjects were trained five days a week. It was concluded that running for fifteen minutes a day at a heart rate of 150 beats per minute for seven weeks significantly increased cardio-respiratory endurance.

Baker⁷ compared the effects upon cardiovascular efficiency that resulted from programme of rope skipping & jogging. He selected ninety two male subjects for the study. The Harvard step test was conducted to determine the cardiovascular efficiency of subjects before and after the training. He concluded that a daily ten minutes programme of rope skipping will significantly improve cardiovascular efficiency as measured by Harvard step test and that a ten


minutes daily programme of rope skipping was as efficient as a particular 30 minutes daily programme of jogging for improving cardiovascular efficiency as measured by Harvard step Test.

Harper, Billings and Mathews conducted a study of the effects of two physical conditioning programmes on cardiorespiratory fitness of 25 college men. The subjects were placed into three matched groups on the basis of maximum oxygen consumption. One group participated in the modified army conditioning programme of calisthenics and marching, while the second group participated in a programme of interval training involving running. The third group (control) participated in recreational activities. The groups met five days per week for seven weeks. Cardiorespiratory efficiency was measured by the help of Harvard step test. The results showed that both interval trained and army trained groups improved significantly in their cardiovascular efficiency. The control group did not significantly improve.

---

Jackson, Sharkley and Johnston\(^9\) randomly assigned twenty young male volunteers to one of the training groups and a control group to study the effects of various training frequencies on Cardio-respiratory endurance. Training consisted of treadmill running at a rate of seven miles per hour for ten minute period. As each subject completed a ten minute run the grade was increased one percent for the next training period. The subjects were trained for one, two, three or five days per week for five weeks. It was concluded that training two or three times a week was as beneficial as five day programme.

Chlocking\(^{10}\) studied the effect of two training programmes on selected cardio-respiratory variables of college women. The physiological reactions measured were pulse rate, respiration and oxygen consumption. The respiratory variables were recorded simultaneously by a respirometer. The cardiovascular reaction was measured by counting the pulse rate. All variables improved during the four weeks of training period regardless of the training programmes prescribed. Both training programmes were of


sufficient duration and intensity to effect changes in post exercise scores.

Glinski\textsuperscript{11} studied the effects of Fartlek, sprint and interval training on cardio-respiratory endurance. The subjects were 77 freshmen college males. The covariance statistical technique was used in analysing the data. Harvard step test and 800 yard run measured cardio-respiratory endurance. It was concluded that Fartlek and Interval Training methods were more effective than the sprints method of training in developing cardio-respiratory endurance.

Dobie\textsuperscript{12} investigated the effectiveness of a conditioning programme on selected Tennis skills and cardiovascular efficiency of twenty-two women Inter-Collegiate tennis players. They were ranked and matched by the Hewitt Tennis Achievement Tests and randomly placed into control and experimental groups. Both groups participated twice a week in a continuous and strenuous twenty minute


\textsuperscript{12} Dorothy Dolores Dobie, "Effectiveness of a conditioning programme on selected Tennis skills of women" \textit{Research Quarterly}, 40 (March 1969), 38 as cited by A.K. Uppal, Meera sood, "The Effect of Physical Fitness Programme on Performance in Selected Track and Field Events", \textit{SNIPES Journal}, 4:2 (April 1981), 41-44.
conditioning programme. At the beginning and again at the end of the Tennis seasons, the skubic Hodgkins cardiovascular Efficiency Test was given. The Hewitt Test was given before and after a tennis match at the beginning and end of the tennis seasons. The paired 't' test was used to analyse the data. Both groups improved significantly in cardiovascular efficiency, but there was no significant difference between them. Only the experimental group improved significantly in tennis skills. A comparison between the two groups revealed that the experimental group improved significantly more than the control group.

Santo selected 76 college age men to study the effects of physical conditioning programmes on cardio-respiratory endurance. The subjects were divided into four groups. Three of which participated in different physical conditioning programmes and one remained as control group. Three conditioning programmes were (1) Coopers aerobic programme, (2) Interval training and (3) Regular physical education programme. Cardio-respiratory endurance was measured by Harvard step Test, 12-minute run/walk test, a three minute shuttle run and one minute lateral jump. It was concluded that Interval training, aerobic conditioning

---

and regular physical education programme groups improved significantly in cardio-respiratory endurance in comparison to control group.

Cardiovascular changes in 18 college athletes during training were compared by Henry\textsuperscript{14} with 15 control who were physically active but did not engage in a systematic regime. After training there were no significant differences in body weight or surface area but significant differences in heart rate occurred.

Ahost\textsuperscript{15} conducted a study of the effect of initial cardiovascular condition type of training programme, and frequency of practice periods upon cardiovascular development of college men with the score obtained in an initial Harvard step Test represented initial cardiovascular condition. The type of conditioning programme was either 60 seconds of isometric exercises of a one-minute run take either two, three or five days per week. Subjects were 240 male physical education students. The 12 training groups used different combinations of the three variables. A


\textsuperscript{15} Robert Allen Ahost, "A study of the Effect of Initial Cardiovascular condition, Type of Training programme and Frequency of practice periods upon cardio vascular Development of college men" Completed Research in Health, Physical Education and Recreation, 6, (1964), 68.
three factor analysis of variance was used. No significant difference was found between the type of exercises for the Harvard step test scores. Those in below average condition tended to gain more than those in above average cardiovascular condition, but during the study, the below average group did not obtain the condition of the above-average group. Five days of exercise proved to be significantly better than two or three days per week in developing better cardiovascular condition.

Wallance investigated the effect of training for competition rowing on cardiovascular condition measured by the Brachial on nine varsity and six freshmen rowers given brachial sphygmograph tests every week during an intensive training programme of testing for ten weeks. Fifteen measurements were made on each sphygmograph. The ten values for each measurement were tested for linearity of regression. Only heart rate and blood pressure measurements of same rowers were linearly related to time spent in training. The mean values of most of the CardioVascular measurements were excellent compared with mean values of other athletic groups reported in the literature.

---

Holt\textsuperscript{17} selected 71 volunteers and randomly assigned them to one of the two jogging regiments namely slow jog regiment and Fast Jog Regiment and the third group (Non-Jog). The subjects were trained thrice a week for twelve weeks. It was concluded that slow jog regiment and fast jog regiment of training significantly improved cardiovascular fitness.

Worshan\textsuperscript{18} studied the effects of different training frequencies on selected physical fitness measures in college men. Forty-two subjects who participated in the study ranged in age from 18 to 24 years. It was calculated that exercising at 75 percent of the difference between the resting and maximum heart rate, two days per week, 20 minutes per day was sufficient to produce Cardiovascular fitness gains. Exercising at 75 percent of the difference between the resting and maximal heart rate four days per week ten minutes per day was sufficient to produce cardiovascular fitness.

\textsuperscript{17} Hansford B. Holt, "Two Jogging programme of Different speeds Related to Cardio-Vascular Fitness of middle aged men," \textit{Dissertation Abstracts International} 33 (November 1972) : 2149-A.

\textsuperscript{18} Raymond Lee Worshan, "The Effect of training Frequencies on selected physical fitness measures in college men," \textit{Dissertation Abstracts International} 33 (September 1972) : 1012-A.
Smith\(^1\) compared the effect of six weeks aerobic dance with the effect of six weeks aerobic jogging. Seventy-six girls registered in Physical Education classes at Patel Junior High School were selected as subjects. The subjects were divided into three groups, dance, jogger and control. The subjects were pre-tested and post-tested. Results of study indicated that six weeks programme of aerobic dance and six weeks programme of jogging will increase the cardiovascular efficiency and reduce the percent of body fat. Results indicated no significant difference in the effects of the two programmes.

Robinson and Sueec\(^2\) trained two groups of athletes for thirty minutes of running. One group was continuously running for the entire duration. Whereas the other group ran 100, 200 and 300 meters at intervals with a work rest ratio of 1:3. The control group continued with normal work practice. Their results showed that the mean of Vo2 max. Scores increase 8.9 percent for distance group and 3.1 percent and 3.2 percent for the interval and control groups.


respectively. The anaerobic threshold changes resulted in the average increase of 15.6 percent for VO2 max. Anaerobic threshold for distance group and 11.3 percent for interval group and 6.5 percent average increase for control group. Thus they concluded that moderate and intensive training increase anaerobic threshold as well as endurance performance and also changes were more closely related to endurance performance than VO2 max. changes.

Yoest in his study of comparison of relationship between cardiovascular fitness and selected anthropometric measurements in eighth grade boys and college male subjects. Yoest concluded that age, height, lean body mass and body surface area did not significantly limit performance in Ohio state university step test. However, body composition representing body fat, limited the performance of college men only. In adolescence, scores in the step test improve larger percentage of lean body tissue.

Pollock conducted a study on the effect of walking on body composition and cardiovascular function of middle aged

---


men. He observed that the experimental group increased significantly in maximum oxygen uptake capacity, pulmonary ventilation and oxygen pulse whereas the maximum heart rate, resting heart rate and systolic blood pressure did not change. The resting diastolic blood pressure reduced significantly. Body composition showed reduction in total body weight and percent fat. The controlled group remained constant in most cardiovascular and body composition measures. He concluded that vigorous walking training had a significant effect on cardiovascular function and body composition of adult men.

Riendeau \(^{23}\) examined the relationship between percentage of body fat and selected motor fitness tests. Significant negative correlations ranging from -0.29 to -0.68 were found between percent body fat and selected motor fitness tests. The tests items most affected by fat were those which involved running & jumping. Weight did not significantly effect the performance of any of the test items except the 220 yard dash.

Welk\textsuperscript{24} studied to find the effect of intensive physical training on obese and lean subjects, the importance of overweight, personality characteristics of overweight children and exercise, nutrition and weight control. It was concluded that physical inactivity was the most significant etiological factor in obesity, that a sustained regime of intensive physical training would completely change physical character and that under the influence of exercise all structural, behavioural, metabolic and functional characteristics of fat children underwent decisive changes.

Cureton\textsuperscript{25} determined the relationship between three independent body composition measure and scores on 13 physical performance items in 54 pre pubescent boys, 8-11 years of age. The body composition measures included body density obtained using hydrostatic weight with residual volume determination, total body potassium (grams) obtained by whole body counting of radioactive potassium 40 and the sum of ten skin fold thickness measurements obtained using large skin fold calipers. The physical performance items included the seven items of the AAHPER youth fitness test, vertical jump, mile run and four dynamometric strength test.

\textsuperscript{24} John B. Welk, "Fitness and Fatness." \textit{Research Quarterly} 28 (October 1964), 258.

\textsuperscript{25} Kirk J. Cureton, "Relationship between Body Composition and physical performance in Prepubescent Boys". Abstracts of Research Paper AAHPER Convention (1973) : 111.
It was concluded that other factors or combination of other factors was of more importance in predicting the physical performance items investigated, except in the case of static strength where fat free weight appeared to be the dominant factor.

Boilean conducted a study on young adult male, whose body fatness ranged from 9.8 percent to 46.4 percent. They were classified into two groups. 8 were obese and 15 were lean. Initially physical performance and body composition measures were taken to assess the control status of each subject. Body composition measures includes anthropometric, densiometric and hydrometric analysis. They were designed to elevate the daily calories expenditure by 500 to 600 cal. and were conducted for 1 hour/ day, 5 days / week for 9 weeks. The physical conditioning programme was sufficient to improve physical performance and alter body composition. Similarly in subjects of body groups, Body composition changes during the conditioning period resulted in loss of body fat and gain in fat free weight in both groups. The obese groups decreased significantly in body weight. Body density increased and skin fold thickness decreased in both groups.

Greenberg studied the effects of two interval training programmes on running ability. Two experimental groups of thirty subjects each and a control group of twenty-four subjects were employed in the training programme which was conducted three times weekly for seven weeks. Both the groups trained over distances of 110, 220, and 330 yards. In one group speed running was held constant while the number of repetitions of each distance were increased. The second group ran a fixed number of repetitions at progressively faster speeds. Both experimental groups improved significantly over the control group. However no significant difference in improvement of running ability over a 440 yards distance was found between the experimental groups.

Viru, Urgenstien and Pisuki trained students in nine groups employing different methods ranging from long uniform runs (20-30 mix) to fast interval training (40-50 minutes). They noted a significant increase in the heart volume as a result of interval training. A continuous run fartlek method was more effective in increasing oxygen carrying

27 Franklyn R. Greenberg, "The Effects of Two Interval training Programmes on Running Ability". Complete Research in Health, Physical Education and Recreation 8: (1966), 83.

capacity of the blood. Greatest reduction in 800 mets. run
time was made by the group trained on a 15 degree slope (-
26.6 sec.). While the least reduction was made by the long
uniform running group (-13.6 sec.) They concluded that
exclusive employment of one method did not provide
development of the total organism and might ultimately
impair the performance.

Ragg studied the effect of the selected recovery
periods during interval training on metabolic energy
sources. Two groups of six untrained subjects each
participated in a interval training programme, consisting of
a maximum of nineteen 30 seconds runs per workout on a
treadmill. Group 'A' recovered to a pulse rate of 140 beats
per minute while groups B to a pulse rate of 120 beats per
minute. The programme was followed thrice a week. He
concluded that (1) an eight week high intensity interval
training did not cause significant heart rate indicator's of
140, 120 beats per minute, (2) resting heart rate could be
reduced significantly regardless of the length of the
recovery interval, (3) maximum heart rate could be reduced
after training, (4) the minimum recovery period i.e. 140
beats per minute seemed more effective in inducing changes

29 Terry Edwin Ragg, 'The Effects of Selected Recovery periods During Interval Training on
Metabolic Energy Sources' Dissertation Abstracts International 34 (October 1973) : 1492 - A.
than the minimum suggested rate of 120 minutes and (5) Physical work capacity showed substantial improvements as a result of eight week period of training.

Uppal selected 80 untrained subjects and divided them equally into three experimental and one control group, to determine the effects of Interval training and two continuous load methods on Cardio-respiratory and physiological parameters. One group was given interval training, the second fartlek and third group was given slow continuous running for a period of ten weeks. The load was progressively increased. He found that all the three groups had equal training effects on maximal oxygen uptake, vital capacity, leg strength, +ve breath holding - ve breath holding time. Slow continuous and fartlek methods indicated significant improvements in cardiovascular endurance when compared to interval training.

---

30 Arun Kumar Uppal, "Comparative Effects of Two Duration Load Methods and Interval Training Method on Cardio-respiratory Endurance and selected Physiological Variables" (Unpublished Doctoral Dissertation, Jiwaji University, Gwalior, 1980).